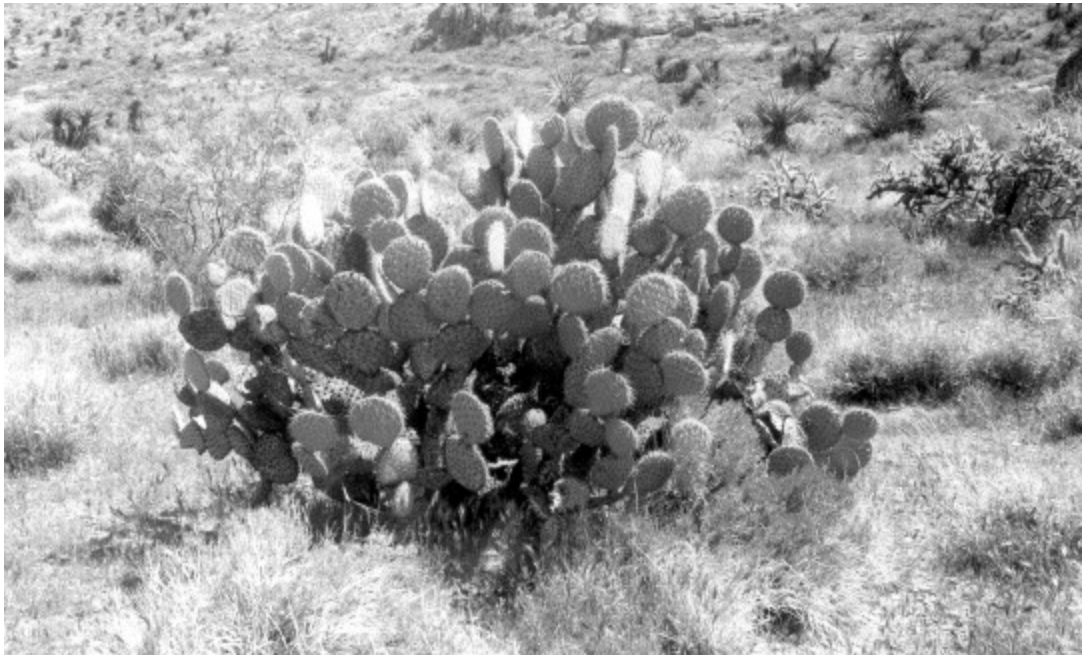


## AFFECTED ENVIRONMENT



*prickly pear cactus*

Affected Environment

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# LAND STATUS

## PRESERVE BOUNDARY

### OFFICIAL MAPS AND AUTHORIZED ACREAGE

Section 502 of the California Desert Protection Act established the Preserve and cited the acreage at approximately 1,419,800 acres. The Congressional maps delineating the boundary of the Preserve and referred to in section 502, are dated May 17, 1994, are often commonly called the “S-21 Maps.” This set of 21 blue-line map sheets provided the basis for the National Park Service to prepare the official boundary maps and legal description (see appendix C of the *Land Protection Plan*). The National Park Service prepared the official boundary maps (seven map sheets dated July 1996) according to the section 504 and submitted them to Congress in August 1996, completing the legislative process of preparing official boundary maps of the Preserve. These maps are on file with the superintendent for inspection. All map figures in this document utilize a digitized version of the official boundary.

The acreage of the Preserve identified in section 502 was an estimate based on calculations done manually, and apparently did not include some private lands in Lanfair Valley. However, sections 516 and 517 of the California Desert Protection Act provide authority to acquire **any** lands within the boundary of the Preserve (under certain conditions prescribed), and that acquired lands automatically become a part of the Preserve. The National Park Service interprets the Congressional language and official maps to mean that private lands, other than Catellus, in the Lanfair Valley area, are not part of the Preserve for purposes of regulation, but because they are included within the external boundary, they may be acquired and would then become part of the Preserve automatically. Therefore, the official boundary map submitted to Congress reflects a more accurate total acreage of 1,589,165 acres of land included within the external boundary of Mojave. The “Land Protection Plan” (appendix C) provides a breakdown of the landownership. As parcels are acquired, the official boundary maps and legal description would be updated to reflect the change in status for these Lanfair Valley parcels.

## WILDERNESS

On October 31, 1994, Congress designated about 695,200 acres (50%) of Mojave National Preserve as wilderness. Figures 2 and 3, and the back pocket map, provide an overview of the wilderness boundaries that have been interpreted by the park from the Congressional maps.

### OFFICIAL MAPS AND LEGAL DESCRIPTION

Section 602 of the California Desert Protection Act requires maps and legal descriptions of the wilderness areas be prepared as soon as practicable. The process of “interpreting” the Congressional wilderness boundaries and preparing the official maps and legal descriptions is underway. The wilderness boundaries shown in figure 2 reflect the preliminary final maps for which legal descriptions would be prepared. Once completed, final wilderness boundary maps would be submitted to Congress. It is assumed that the actual wilderness acreage may deviate from the approximate acreage of 695,200 acres estimated in section 601 of the act.

## FIRE MANAGEMENT

Data gathering and research began in fiscal year 1998 (FY 98) to examine the history of fire and its effects on the natural environment. Results from this effort and other information will be used in the

developing a fire management plan. Preparation of the plan is scheduled to begin in FY 99. An ongoing vegetation mapping effort by the U.S. Geological Survey will help the park refine fuel types and their distribution.

## **DISTURBED LANDS**

Disturbance of the native vegetation and soils in the Preserve has occurred as a result of many human activities, including mining, road building, utility lines, dumps, grazing, burros, offroad vehicles, and fire. No comprehensive inventory of this disturbance has been completed to document the areas, period of disturbance and extent of recovery. However, some inventory work has been initiated, such as for abandoned mines. Some of the disturbed areas are still subject to the use that caused the disturbance, and would not be subject to rehabilitation until such time as the activity is curtailed.

### **ABANDONED MINES**

The Preserve has an inventory of abandoned mining properties that was generated from existing information in U.S. Geological Survey and Bureau of Mines databases. This inventory reflects a legacy of past mining in the Preserve has left an estimated 419 abandoned mine sites with possibly thousands of mine openings and workings. Preliminary observations indicate the problem is a significant land management issue that may deserve program status. The Preserve initiated detailed and comprehensive inventories of these sites in 1998 and will continue this inventory and documentation process.

### **HAZARDOUS MATERIALS**

Numerous potential hazardous material sites exist within the Preserve. These locations are primarily related to mining activities where chemical processing took place. There are also documented instances of illegal waste dumping or clandestine drug lab activities. Potential hazards are prioritized and investigated based on relative threat posed to human health and the environment. Following is a description of some of the hazardous materials site investigations that have occurred recently in the Preserve.

#### **Morningstar Mine**

- A formal Potentially Responsible Party (PRP) Search is underway.
- CERCLA Notice and Demand Letters have been issued.
- Lahontan Regional Water Quality Control Board is considering issuing a new Clean-up and Abatement Order (CAO) to Mojave.
- Sizeable ore piles with documented cyanide and heavy metal contamination must be stabilized and reclaimed. Pad #2 has suffered significant erosion, which could result in release of contamination beyond its containment.
- Mine owner has expressed on-going interest in re-opening the operation but has made inadequate efforts at providing NPS assurance that they are financially viable to conduct necessary restoration prior to being granted an operating permit.

#### **Sterner Claims (Rainbow Wells and Columbia Mine)**

- Two locations have undergone time-critical removals in the past.

- Residual contamination has been documented at each of these locations; complete delineation and removal of this contamination is necessary. Documented lead contamination in soil ranges up to 9,700 ppm. (1,000 ppm hazardous waste threshold according to CA TTLC)
- Both locations show evidence of mining with chemical extraction conducted on site.
- Clandestine drug laboratory activity has occurred at Rainbow Wells.
- Both locations are mine sites and also act as attractive nuisances to park visitors.
- Mojave has been granted \$100,000 of project funds to address building demolition, solid waste removal, and site restoration.
- Mojave is formulating a proposal for possible cost share with the California Integrated Waste Management Board (CIWMB) to address Rainbow Wells and Columbia Mine.

#### Telegraph Mine

- This location has potential for Hazmat removal; staff has observed: abandoned fuel tank, petroleum spills from vandalized heavy equipment, drums, small containers, process equipment, and potential cyanide ponds.
- Complete site characterization must be conducted.
- Heap Leach piles with suspected cyanide and heavy metal contamination must be stabilized and reclaimed.
- A formal Potentially Responsible Party (PRP) Search is underway.

#### Hole-in-the-Wall

- Replacement of the existing electric generator (including fuel supply system) has been requested under an equipment replacement funding source.
- Removal/remediation of contaminated soils and secondary containment area will be required.
- The existing system has suffered from damage to structural integrity (the vent reportedly failed causing the tank to become over-pressurized and bulge, spillage was associated with this event).

## NONFEDERAL LANDOWNERSHIP AND USE

In 1994, when the Preserve was established, there were over 2,000 nonfederal land parcels within the boundaries of Mojave National Preserve totaling nearly 220,000 acres. In addition, there are hundreds of outstanding rights that are owned by individuals or corporations (water rights, mining claims, rights-of-ways, easements). The following discussion provides an overview of the nonfederal lands and interests that occur in the Preserve.

### **CALIFORNIA STATE LANDS**

#### **School Land**

The State Lands Commission owns and manages land in the state for the benefit of the state. In the Preserve, sections 16 and 36 of each township were once owned by the state. Some of these have since been sold or traded. When the Preserve was established in 1994, the state owned all or portions of 88 sections totaling 50,465 acres. Section 707 of the act details a procedure whereby the Secretary of the Interior will negotiate an agreement with the State Lands Commission to exchange federal lands for “California State School lands or interests therein which are located within the boundaries of one or more of the wilderness areas or park system units designated by this Act.” That agreement was signed by the state director of the Bureau of Land Management, acting on behalf of the Secretary of the

Interior and the State Lands Commission on October 26, 1995. The Bureau of Land Management's state office in Sacramento is currently managing the program to exchange state school lands that are in parks or wilderness areas designated by the California Desert Protection Act. In early 1998, the first exchange occurred, resulting in the National Park Service receiving title to portions of 22 sections totaling 15,066 acres.

### **Department of Fish and Game**

The State Department of Fish and Game owns one tract of land in the Preserve, totaling 139.4 acres. This tract is at Piute Springs at the lower end where the old fort remains are located. Piute Creek is a perennial stream and presumably the purpose of the state's ownership is riparian habitat preservation and is consistent with the Preserve mission.

### **Department of Parks and Recreation**

The state owns and operates the Providence Mountains State Recreation Area, which is located within the boundaries of the Preserve, about 15 miles north of I-40 off Essex Road. The prime attraction is Mitchell Caverns, where guided tours are offered. The state owns 5,251 acres at this location. This site is managed by the state under a cooperative agreement with the National Park Service. The state manages this area in a manner compatible with the purposes of the Preserve. A developed campground with six campsites and RV camping on the lower parking lot receives an estimated 25,000 users per year. The caverns tour attracts an estimated 14,000 people each year. The total annual use of the state park in 1986 was estimated at 60,000 people.

### **University of California**

The Regents of the University of California own and manage 2,199 acres of land in the Granite Mountains as a component of the university's reserve system. Congress designated the reserve in the California Desert Protection Act as the Granite Mountains Natural Reserve and specified that 9,000 specified acres (including the state ownership) be managed under a cooperative agreement between the National Park Service and the university to ensure the continuation of arid lands research and public education.

### **PRIVATE LANDS**

Beginning about 1910, settlers established homesteads and attempted dry land farming in the east Mojave. Homesteads were established in many places, including Barnwell, Crucero, Goffs, Pinto Valley, and primarily in Lanfair Valley area where 200–250 patents were issued. By 1920 dry years had forced most homesteaders out. Less than 50 people are permanent residents in the Preserve now, with most private tracts being mostly undeveloped. Major blocks of private land are found in the Lanfair Valley area where hundreds of parcels totaling over 70,000 acres occur. The remainder of private lands is scattered throughout the Preserve. Total private land in the Preserve, not including Catellus lands, is 86,708 acres.

### **Catellus**

Catellus Development Corp. managed a checkerboard of lands across the southern one-half of the Preserve totaling approximately 82,700 acres. These lands were originally granted to railroad companies in the 1800s by the federal government as an incentive to build the transcontinental railroad. In June 2000, the Wildlands Conservancy and National Park Service cooperated in jointly funding the acquisition of 82,628 acres of Catellus lands.

## **MINING CLAIMS**

### **Patented**

Patented mining claim groups exist in about fourteen areas of the Preserve, totaling approximately 1,350 acres. These are mining properties obtained under the 1872 Mining Law, where the owners have met the federal requirements to obtain title to the surface and subsurface estates. Mining on patented claims is subject to NPS regulations at 36 CFR Part 9A, the same as on unpatented claims.

### **Unpatented**

The Preserve was closed to new mineral entry on October 31, 1994 by the California Desert Protection Act. Claimants who had properly staked and recorded mining claims by that date may have a valid existing right to mine the minerals. However, Congress requires the National Park Service to determine the validity of all unpatented mining claims in the Preserve. This is a lengthy, technical process that requires specially trained staff. In addition, claimants are required to pay annual maintenance fees to the Bureau of Land Management by August 31 each year to retain an ownership interest in their claims. Therefore, it is reasonable to assume that the number of unpatented claims will continue to decline each year as claimants cease to pay required maintenance fees, or are unable to adequately demonstrate a discovery under the validity process.

As of June 2000, there were approximately 471 claims in 28 groups totaling just over 12,500 acres. (See appendix C).

## **WATER RIGHTS**

Initial research on outstanding water rights in the Preserve recorded at the State Water Resources Control Board in Sacramento revealed that there are approximately 110 appropriated water rights claims on 97 water sources (springs, seeps, streams, wells) in the Preserve. Many of these were obtained by ranchers who lease grazing allotments. Other rights may exist that have not been recorded with the State. Water rights that were held by the BLM on numerous water sources have been converted to NPS. In April 2000, the NPS accepted donation of the Granite Mountains grazing permit, including water rights on 29 sources.

## **MANAGEMENT OF PARK RESOURCES**

### **NATURAL RESOURCES**

#### **PHYSICAL RESOURCES**

##### **Air Quality and Visibility**

The Mojave Desert Air Quality Management District manages and enforces the Clean Air Act's air quality standards in the Mojave National Preserve. The district includes the desert portion of San Bernardino County.

Congress established the Prevention of Significant Deterioration program as part of the Clean Air Act. To facilitate the implementation of this program, an area classification scheme was established. This classification scheme has class I receiving the highest degree of protection with only small amounts of certain kinds of additional air pollution (sulfur dioxide and particulate matter) allowed. The other two areas are class II, which allows moderate increases in certain air pollutants; and class III, which allows a large amount of new air pollution (Congress has yet to designate any class III areas). There are no class I areas in the California Mojave Desert. Mojave National Preserve is a class II "floor" area, meaning that it may never be redesignated to class III.

##### **Federal and State Nonattainment Areas**

The Clean Air Act developed national ambient air quality standards for a finite number of pollutants called "criteria pollutants." The criteria pollutants are: sulfur dioxide, carbon monoxide, total suspended particulates, nitrogen oxides, lead, ozone, and particulate matter less than 10 microns in diameter (PM<sub>10</sub>). State of California standards, which are stricter than federal standards, include additional standards for hydrogen sulfide and particulate sulfates.

The Environmental Protection Agency has classified the Mojave National Preserve as a nonattainment area for ozone and PM<sub>10</sub> standards. Nonattainment areas are areas that are not in compliance with the national ambient air quality standards, and therefore must reduce pollution to reach compliance. Nonattainment requirements include reasonable controls on existing stationary sources, most stringent controls on new sources, emission offsets, transportation control plans (including inspection and maintenance), and sanctions for failing to submit a plan.

##### **Viewsheds/Visual Quality**

Visibility is probably the most important air quality resource in the desert region, and it is the most easily affected by activities that generate dust (especially fine particulates) and sulfur dioxide. Visibility impacts occur from long-range transport of pollutants from as far away as the San Joaquin Valley and the Los Angeles basin (RESOLVE study 1988, cited in BLM 1995).

Nearby sources of emissions include the Army's National Training Center at Fort Irwin; Viceroy Mine near Searchlight, Nevada; the Mojave Generation Station near Laughlin, Nevada; MolyCorp Mine and Stateline Power Generation Station near Primm (Stateline), Nevada; and vehicle traffic on Interstates 15 and 40.

Local pollution sources in the desert consist primarily of particulate matter from off-road vehicles, windblown soil, mining operations, livestock grazing, and agricultural activities. These sources have left certain areas denuded or sparsely vegetated, allowing wind erosion to occur and air quality to suffer and occasionally causing violations of particulate standards at many locations.

## **Night Sky**

The night sky of Mojave National Preserve is dark and offers visitors and researchers opportunities to enjoy star gazing mostly untainted by artificial light reflection. However, the northern and southern boundaries are interstate highways. Traffic on these highways and the lights from Baker, Primm, and Laughlin are beginning to have a noticeable adverse effect on the night sky. No known background data currently exist that document the dark sky.

## **Natural Ambient Sound**

The Preserve is generally a quiet landscape, with occasional, short-term interruptions of the natural quiet. Depending on the atmospheric conditions, the closeness to a noise source, and topographic features, visitors generally experience little noise while in the backcountry. Occasional overflights of commercial jets at cruising altitudes, small private aircraft, and rare military jets at low altitudes may be heard. Vehicle noise is generally not an issue within the Preserve in spite of the nearby major roads (I-15, I-40, and major paved roads). Because of the Preserve's vastness, most areas are well away from traffic and its noise. Other areas where localized noise occurs are at the Rasor Open Area, adjacent to the western boundary of the Preserve, the Union Pacific and Santa Fe rail lines, and mining operations. The Union Pacific and Southern Pacific railroad lines are heavily used, but the faint distant rumble of freight trains is only occasionally audible when one is within a few miles of the tracks.

## **Soils**

A wide array of soils comprises Mojave National Preserve. Examples include: soils with sandy textures with gravel and cobble cimas; soils with medium textures; soils with calcium carbonate (e.g. caliche) accumulations; fine textured soils found in play a prone areas; soils with a developed horizon reflecting age or formation during a different moisture regime; shallow soils; and upland soils. The park also contains escarpments, ephemeral streams, a large area of dunes, and a lava flow area (e.g. Lava Beds). Detailed soil surveys have not been conducted. However, a digitized, general soils map is available from the statewide digital soils database.

## **Water**

### **Groundwater**

Groundwater is found underneath most of the Preserve and varies greatly in depth and quality. The Mojave River is the primary subsurface water source for the Preserve (BLM 1996). The many groundwater basins in the Preserve are recharged from surface and subsurface infiltration. Depletion of groundwater basins and diminishing water quality are concerns that were expressed at public meetings. Groundwater is the Preserve's principal source for desert springs, seeps, and a few ephemeral streams, and its only perennial spring, Piute Creek. The maintenance of groundwater quality and quantity is critical to the survival of desert surface waters and their associated plant and animal life.

There are two major areas of concern for Ivanpah Valley. One is groundwater depletion, as the water is being used to maintain golf courses and to supply MolyCorp's mining operation at Mountain Pass. Water levels in the Ivanpah basin have declined an average of about 2 feet per year for the past 50 years (MolyCorp 1996). This depletion did not include the golf courses that were completed in 1996. MolyCorp is also proposing to enlarge its mining operations, including a substantial dewatering of new mine pits. This dewatering could cause the springs to go dry in the Clark Mountain segment of the Preserve. The other concern is the contamination of Ivanpah Dry Lake's surface and groundwater from MolyCorp's legal and illegal mine waste discharges.

Another site near the Preserve where the rate of groundwater use appears to exceed normal groundwater recharge is the Castle Mountain Mining Project Viceroy Gold Mine, which is adjacent to the Preserve's eastern boundary. At Castle Mountain the average groundwater withdrawal has been over 400-acre feet per year since 1996 (BLM 1997). This mining operation will cease mining in 2000 or 2001, but will continue processing/recovery of gold from the heaps for approximately two years after cessation of mining. Well data has shown a continued drop in water levels, indicating that the withdrawals exceed groundwater recharge.

Recently, a major groundwater threat has surfaced about 15 miles south of the Preserve. Cadiz Development Corporation is proposing a massive groundwater storage and pumping project in cooperation with Metropolitan Water District in Los Angeles. This project would pump groundwater that originates in the Preserve and would have unknown consequences on Preserve water sources.

### **Surface Water Sources**

The small springs and seeps in the Preserve offer isolated and limited water for plants, wildlife, or domestic or commercial purposes. Some springs produce potable water, but overall water quality is poor because of high dissolved mineral concentrations (BLM 1996). Over 200 springs and seeps have been identified in the Preserve (King and Casebier 1981). Many, if not most, have been altered by the installation of retention dams, pipelines, and troughs for livestock use. Most are also available for wildlife and burro use. In the eastern portion of the Preserve is a 1-mile perennial stream called Piute Creek. Recorded spring outlet flows (measured monthly since June 1988) have ranged from 21 gallons per minute (gpm) in November 1991 to 58 gpm in December 1993. The average over this time was 42 gpm (Viceroy Gold, 1997). This stream, the only perennial stream in the Preserve, is an important wildlife water source as well as a popular recreation site.

Some people have said that historic and present mining and cattle ranching have resulted in less water for wildlife consumption being available now than was available about 220 years ago, when the first Europeans entered the Mojave Desert. The literature offers no evidence to support these claims; rather, it indicates that there may be more water now. Accounts from the late 18<sup>th</sup> and early 19<sup>th</sup> centuries by Garces and Jedediah Smith and from surveys conducted by Thompson for the U.S. Geological Survey in the early 20<sup>th</sup> century indicate that water holes were few and far between. The number of springs and seeps that are now known is far greater than the early inventories recorded by Thompson. With the addition of wells and guzzlers, it may seem that there is more available surface water now than in the past.

Water wells have been drilled primarily for domestic use and livestock needs, but a number of wells have also been drilled for mining use. Viceroy Gold Mine has developed a well field that is adjacent to and within the Preserve. This well field is within a 9-square mile area located northwest of the mining site. Viceroy is permitted to pump 725 acre-feet per year, but it has been averaging about 400 acre-feet (about 11 million gallons per month) since 1995 (BLM 1997).

Water wells have been drilled specifically for visitor and administration use at the Mid Hills campground and Hole-in-the-Wall campgrounds.

### **Floodplains and Wetlands**

No systematic inventory of 100 and 500-year floodplains, or wetland areas has been undertaken in the Preserve. Some general information is available on USGS topographical maps. Specific inventories are often conducted when a development project may encounter these resources.

### **Water Rights**

Initial research on outstanding water rights in the Preserve that are recorded at the State Water Resources Control Board in Sacramento revealed that there were approximately 110 appropriated water rights claims on 97 water sources (springs, seeps, streams, wells) in their records that exist in the Preserve. Many of these were obtained by ranchers who lease grazing allotments. In April 2000, the NPS accepted donation of the Granite Mountains grazing permit, including water rights on 29 water sources. Other rights may exist that have not been recorded with the State. See “Appendix C: Land Protection Plan” for a list.

### **Paleontological Resources**

The Preserve contains a fragile and irreplaceable paleontological record. The richness and diversity of that record is unknown as significant inventory work has not been performed on the various geologic formations that do or could contain fossil resources. Fossils have many values including (1) stratigraphic indicators for correlation of deposits containing them and for determination of relative geologic age, (2) records of past life forms showing the course of evolutionary trends of plants and animals, and (3) evidence of changing paleoenvironments.

A literature and records search was completed for the Preserve area by Robert E. Reynolds, Curator, Earth Sciences, San Bernardino County Museum, Redlands, California. The records and literature search identified a number of potentially sensitive fossiliferous areas in the planning area. Significant paleontological resources and records relating to paleobiostatigraphic events that occur within or near the Preserve are as follows:

- The world’s oldest mitosing cells, 990 million years old, are preserved in silica in the Beck Spring Formation.
- Significant Cambrian trilobite and invertebrate fossil localities mark the boundary of the Paleozoic Era, 550 million years of age.
- The only dinosaur tracks in California and the only record of Jurassic dinosaurs in California are in the Mescal Range, just north of the Mojave National Preserve.
- Early records of crustal extension and breakup that occurred 24 million years ago to form basins in the Mojave Desert are found in or near the Preserve. Significant occurrences of fossils, including rhinoceros, camel, canid, felid, bird track, and plant, are located in the Ship Mountains, Little Piute Mountains, Hackberry Mountains, Castle Mountains, Lanfair Valley, and Wild Horse Mesa in or near Mojave National Preserve.
- There are significant Plio-Pleistocene fossil localities, which are being damaged by erosion and amateur collecting, at Valley Wells and Kingston Wash.
- Cave deposits in the Mescal Range have produced significant vertebrate fossils.

### **Geological Resources**

The geology of Mojave National Preserve is very complex and diverse due to igneous and metamorphic activity and structural deformations associated with these activities. Erosional geologic processes have altered the landscape resulting in outcrops of rocks ranging from Precambrian to Recent ages.

The Mojave is characterized by isolated mountain ranges and ridges separated by alluvium-filled, irregular large valleys. Dividing Mojave National Preserve in half is the northeast trending Providence-Mid Hills-New York Mountain ranges. The principal valleys within the Preserve include Ivanpah Valley, Kelso/Cedar Wash, Lanfair Valley, Devils Play ground, Piute Valley and the northern area of Fenner Valley. Ivanpah Valley and Kelso/Cedar Wash line up in a northeasterly to southwesterly fashion, but drain in opposite directions because of an inconspicuous northwest trending divide near the town of Cima. Both Lanfair and Piute Valleys drain via Piute Wash into the Colorado River. The remaining valleys have self-contained drainage systems as represented by playa lakes such as Soda and Ivanpah.

### **Minerals**

Mineral resources in the Preserve range from metallic to nonmetallic, or industrial, minerals. Mines in the Preserve have produced gold, silver, copper, iron, tin, lead, and tungsten. Industrial mineral production includes cinders, fluorite, gemstone, magnesite, marble, and sericite.

The minerals produced in the Preserve are most easily classified by the tonnage and grade available for exploitation. Tin and tungsten deposits in the Preserve are in low-grade deposits of limited tonnage. These metals are considered to have a very low or no potential for discovery of economic deposits. Additionally, the size and grade of any economic deposits would be insignificant in terms of the quantities of these metals produced and consumed on a regional or national basis. Several mines in the Preserve have produced combinations of copper, lead and silver. All these deposits occur as vein or replacement types of limited size and moderate to low grade.

Iron deposits exist in the Preserve and the tonnage and grade was adequate for economic production at one time. The demand for iron ore in the West has diminished because of a restructuring of the steel production industry. The current supply of iron ore in the region exceeds demands for feed stock in cement production. Deposits in the Preserve are small and of moderate grade (40–46% iron).

Gold has been produced from several mines in the Preserve and occurs as vein or disseminated deposits. Most gold production since 1986 has been derived from two moderate size, low-grade, high-tonnage open-pit mines, which are no longer producing. Favorable geologic environments do exist for the discovery of other similar deposits, but these areas have already been explored and evaluated by various mining companies without favorable results. The lack of available unclaimed land and the regulatory constraints for exploration and development seem to preclude the discovery and development of any low-grade, high-tonnage open-pit gold mines in the Preserve. Gold has been mined from vein type deposits in the Preserve, but the known occurrences were of limited length, depth, and width. Deposits of this type have high development and production costs. The limited extent of known deposits in the Preserve makes future economic exploitation of gold in vein type deposits in the Preserve doubtful. The production potential of gold from claims in the Preserve (290,000 total ounces inferred resources from the 1990 report “Minerals in the East Mojave National Scenic Area, California” by the U.S. Bureau of Mines is insignificant in the scope of national and international production and consumption.

Of the industrial minerals in the Preserve, fluorite, magnesite and sericite have small recorded production. The deposits hosting these minerals are of limited size and grade. Deposits of these minerals are insignificant in the scope of national production and consumption. There are also known deposits of cinders and limestone in the Preserve. These deposits are large, and the limestone is reported to be high quality suitable for chemical uses. Cinders have been produced from two deposits in the Preserve, with most of the production used in the Las Vegas, Nevada, area and in Needles, California. Cinders are used for building block and landscape material. Limestone deposits within the

Preserve compete in the Los Angeles market, and there are a number of limestone deposits in production that are closer to the market. There also are other deposits of limestone available for development in the region. Many of these deposits are closer to the Los Angeles area and therefore hold a more favorable market position than deposits in the Preserve. Transportation costs are a large factor in the marketability of industrial minerals, often more critical than quality or tonnage. Limestone deposits in the Preserve have a favorable position because of nearness to transportation, quality, and deposit size, but they must compete in a highly volatile market.

Gemstone resources in the Preserve are all classified as recreational in nature. The gemstones are sought by hobbyists or amateur collectors (individuals and clubs) rather than commercial development. None of the deposits exhibit the characteristics of significant size, uniqueness, or quality to hold a significant place in the gemstone market.

### **Caves**

Caves, as defined by the Federal Cave Resources Protection Act, include any natural feature that a person can enter. They include talus caves, erosional caves, dissolution caves, lava tubes, and others. They do not include mine adits, shafts, or declines. The Mitchell Caverns area within the Preserve has significant cave resources. Many other areas within the Preserve are also known to contain caves as defined by the Federal Cave Resources Protection Act. One of these is the fairly well known lava tube in the Cima/Lava Beds area of Mojave. Other tubes may occur, but a comprehensive inventory has not been completed.

Most of the caves have not been inventoried, so little is known of the specific resources at the sites or the impacts on them. The presence of speleothems (limestone cave depositional features), cultural materials, and bat usage will likely be found in many of the caves.

The Mitchell Caverns Natural Preserve was established in 1954 to protect and interpret two caves connected by a constructed tunnel. The 97-acre Mitchell Caverns Natural Preserve is within the larger 5,890-acre Providence Mountains State Recreation Area, which is operated by the California Department of Parks and Recreation. The developed cave area consists of two small, but well decorated caves. A tunnel connected the two caves, known as El Pavika and Tecopa, in 1968. The caves contain areas of interesting speleothems, provide roost area for at least two species of bats (one of which is *Plecotis townsendii*), and may hold archeological material in the entrance areas. This cave has had a long history of recreational use and has been impacted by human activity.

Cave of the Winding Stair is a small but deep cave in the recreation area, open by permit to experienced vertical cavers. Several other small and unsurveyed caves exist with the local area. Very little is known about these caves and a comprehensive inventory is needed.

### **BIOLOGICAL RESOURCES**

Mojave National Preserve was established to preserve an ecologically diverse, yet fragile desert ecosystem, comprised of scenic, geologic and wildlife values unique not only to the Mojave, but the Great Basin and Sonoran desert environs as well. This transition zone, ranging from nine hundred to nearly eight thousand feet in elevation, embraces a plethora of landforms: cinder cones, sand dunes, dry lake beds, alluvial fans, mountain ranges, table-top mesas, large desert bajadas (alluvial fans) and valleys. This harsh Mojave desert landscape provides refugium for over one thousand plant and animal species, including threatened and endangered species.

## **Flora**

The vegetation resources of Mojave National Preserve reflect the mingling of three major North American Deserts: the Great Basin, Mojave, and Sonoran deserts. The Preserve consists primarily of vegetative attributes of the Mojave Desert but contains floral species of the Great Basin, Sonoran and even some elements of the California Coastal Zone.

Mojave National Preserve is considered a unique floristic area. Many plant species are distributed only within its boundaries; while other areas such as the New York Mountains contain species of manzanita, California lilac, and oak and silk tassel, which are normally associated with coastal California. The Mid Hills have significant stands of Great Basin sagebrush and Utah juniper. The strongest association however, is with the Sonoran Desert, whose northernmost range is often recognized to intermingle with the southern border of the park. Sonoran plant species such as teddy bear cholla and smoke tree are found extending a dozen or more miles into the southeast portion of Mojave National Preserve.

Community types common elsewhere in the desert and also present within the Preserve are the playas, saltbush, creosote-covered flats and alluvial fans, and Joshua tree woodlands. There are also many important unique or rare habitats within the Mojave. The Preserve is unusual in the complexity and density of the Joshua tree, Mojave yucca, and Spanish bayonet communities, which are represented on Cima Dome. The quality and sheer vastness of the Joshua tree forest on Cima Dome is unparalleled anywhere in the world. There are seven different types of wash plant species associations including catclaw acacia, smoke trees, and desert willows. Higher elevations support grassland, sagebrush, blackbrush, pinyon-juniper woodlands as well as unique remnant habitats containing small white fir forests, and pinyon-junipers with oak in the higher elevations. The Piute Creek desert oasis also supports a very fragile and limited community. A total of 803 species of plants representing 85 plant families have been identified in the Preserve (Thomas, 1999). A list of plant species is available.

## **Fauna**

The intermingling of the three desert environments has produced approximately 35 wildlife habitat types. The diverse habitats support about 300 species of wildlife. The literature documents 36 species of reptiles, 206 species of birds and 47 species of mammals. A few of the most notable species include the gila monster, desert tortoise, Mohave tui chub, Mojave fringe-toed lizard, regal ring-necked snake, and desert striped whipsnake. Significant avian fauna include the prairie falcon, Bendire's thrasher, California thrasher, gray vireo, golden eagle, Lucy's warbler, mourning dove and Gambel's quail. The Preserve has one of the more significant bat faunas of the California desert. There are also populations of rock squirrels in pinyon-juniper woodland, a relict population of dusky-footed woodrats, mule deer, porcupines, mountain lions, and desert bighorn sheep.

Significantly, a large portion of the Preserve is critical desert tortoise habitat. Some of the highest densities of tortoise are found in the Ivanpah Valley in the north end of the Preserve. Areas that have been designated as critical habitat for desert tortoise will receive special consideration in considering uses, programs and activities that can be allowed within the Preserve.

In its entirety, the California desert contains no finer grouping of different wildlife habitats than in Mojave National Preserve, both from the standpoint of total number of species and the total number of animals. The Kelso Dunes, Granite, Providence, and New York Mountains, including Cima Dome exemplify the finest habitat types in California.

## Sensitive Species and Habitats

Within the Mojave National Preserve are confirmed populations or potentially viable habitat for 3 federally endangered, 1 federally threatened, 6 state (California) endangered and 1 state threatened plants and animals. The tables in appendix D reflect the overlap of protective designations for these and a number of endemic species. The tables note additional plants ranked as by the California Native Plant Society as CNPS 1B and several endemic plant and animal species not formally recognized by agencies as listed or rare.

Federally listed species known to inhabit the Mojave National Preserve are the desert tortoise (*Gopherus agassizii*) and the Mohave tui chub (*Gila bicolor mohavensis*). Final recovery plans exist for both of these species. The southwestern willow flycatcher (*Empidonax traillii extimus*) and least Bells vireo (*Vireo bellii pusillus*) are listed birds that could periodically inhabit riparian areas such as Piute Spring but have not been verified to occur in the Preserve.

California listed species known to occur in the Preserve are the desert tortoise, the Mohave tui chub, and the willow flycatcher (*Empidonax traillii*). The California (or western) yellow-billed cuckoo (*Coccyzus americanus occidentalis*), normally in need of broad riparian cover, may have some, but limited potential to appear in the Preserve.

There are no known federally listed or proposed plant species in the Preserve. Thorne's buckwheat (*Eriogonum ericifolium* var. *thornei*) is listed by the state of California as an endangered species. It is known from only two occurrences in the Preserve's New York Mountains. This buckwheat is found at elevations upward of 5,500 feet in pinyon and juniper woodland and prefers copper-rich gravel (*The Jepson Manual: Higher Plants of California*, James C. Hickman, ed.)

The species detailed in the text below are designated as federally endangered (FE), federally threatened (FT), federally proposed threatened (FPT), California endangered (CAE), California threatened (CAT), California rare (CA Rare), Nevada critically endangered (NVCE) or Nevada threatened (NVT). Where indicated by a heading of more than one species, discussion is intended to reflect common or closely related habitat needs. Additional information about these and other species of special consideration not discussed below but known or likely to occur within the Northern and Eastern Mojave planning area can be found in appendix D.

### **Desert Tortoise (*Gopherus agassizii*) — FT, CAT**

The range of the desert tortoise includes the Mojave and Sonoran deserts in southern California, Arizona, southern Nevada, the southwestern tip of Utah, and Sonora and northern Sinaloa, Mexico. The Mojave population of the desert tortoise (an administrative designation for animals living north and west of the Colorado River) is listed as a threatened species by the federal government and the State of California. Critical habitat for this species was designated in 1994 (FWS 1994).

The Mojave population of the desert tortoise primarily occupies valleys and bajadas characterized by scattered shrubs. The soils range from sand to sandy-gravel, though caliche soils, desert pavement, and rocky, boulder terrain are occasionally used (FWS 1994). Desert tortoises spend a large portion of the year underground to avoid extreme temperatures and, for younger tortoises, to avoid a variety of predators, such as coyotes, foxes, raptors, and ravens (BLM 1996). Tortoises generally are active during spring, early summer, and autumn when annual plants are most common and daily temperatures are tolerable. Additional activity occasionally occurs during warm weather in winter months and after summer rainstorms (BLM 1996).

As early as the 1970s biologists began to recognize that desert tortoise numbers were declining sharply in many areas. In 1984, the U.S. Fish and Wildlife Service listed the desert tortoise on the Beaver Dam Slope in Utah as a threatened species. The entire Mojave population was listed as a threatened species in 1990 (FWS 1994):

These declines are mainly attributed to direct and indirect human-caused mortality coupled with the inadequacy of existing regulatory mechanisms to protect desert tortoises and their habitat. (FWS, 1994)

Desert tortoise habitat has been destroyed, degraded, and fragmented as a result of urbanization, agricultural development, livestock grazing, mining and roads. The removal of tortoises by humans for pets or for use as food or folk medicine is also a major factor in the decline of the desert tortoise population (FWS 1994). A respiratory disease is an additional cause of desert tortoise mortality and population decline, particularly in the western Mojave Desert (FWS 1994).

Some work has been done by Avery (1998) in the Ivanpah Valley on the diet and forage selection of cattle and desert tortoise in both grazed and ungrazed plots. His work reveals that cattle and tortoise diets overlap (38% in early spring, 16% in late spring). In the cattle enclosure, Avery observed that in late spring tortoises ate primarily herbaceous perennials (91% of diet) versus 21% outside the enclosure, where 59% of their diet was annual grasses (mostly exotics). The species of plants consumed also varied. In the enclosure tortoises preferred desert dandelion (*Malacothrix glabrata*), but outside the enclosure they ate primarily exotic splitgrass (*Schismus barbatus*). In one of the years of data collection, tortoises spent more time foraging (approximately three times) in grazed versus ungrazed areas. In two seasons of data collection Avery observed that tortoise move on to other less preferred plants when ephemeral plant growth was about 70 lbs./acre, whereas, at 230 lbs./acre, the tortoise continued to consume the preferred species.

Mojave has approximately 144 miles of paved and 3 miles of maintained dirt roads that traverse designated desert tortoise critical habitat. Approximately 147 miles of unmaintained roads in critical habitat were closed to motorized vehicles by the Congressional designation of wilderness. Park vehicle counters at the six paved entrances revealed almost 15,000 vehicles entered the Preserve in March 1997. The heaviest used roads are Kelbaker from I-40 to Kelso (about 50% critical habitat), the Kelso-Cima road (100% critical habitat) and the Morningstar Mine road from Cima to the Nipton Road (100% critical habitat). Speeds on these roads often exceed 70 mph. In addition, the Union Pacific railroad corridor passes through the Preserve for about 91 miles, of which about 56 miles is through category I critical habitat. Also, Interstate 15 crosses approximately 25 miles of category one critical habitat and Interstate 40 crosses about 39 miles along the northern and southern boundaries of the Preserve respectively.

In June 1994, the U.S. Fish and Wildlife Service released the *Desert Tortoise (Mojave Population) Recovery Plan*, which presented recommended prescriptions for population recovery. Also included in this document are maps of the tortoise's critical habitat and of areas where recovery actions are recommended. These areas are called Desert Wildlife Management Areas. Within the Northern and Eastern Mojave planning area are the proposed Fenner, Ivanpah, and Piute-Eldorado California Desert Wildlife Management Areas.

The following data in this paragraph are from the Desert Tortoise Recovery Plan. These data show that the Preserve's tortoise population densities are among the highest for the species range. The highest known densities of desert tortoise occur in southern Ivanpah Valley, where about 20 square miles support densities of 200 to 250 per square mile. Throughout much of the northern Ivanpah and Kelso valleys, densities were generally less than 50 per square mile. In the Goffs plot, 363 desert tortoise per

square mile were found. Densities west of Lanfair Road range from 50 to 100 per square mile. East of Lanfair Road densities probably average about 50 per square mile.

The National Park Service is cooperating in an interagency effort to fund and implement rangewide monitoring of the tortoise using protocols and methodologies adopted by the desert tortoise management oversight group. Locations of transects, methodology, frequency, and data analysis would be determined by the park after evaluation of established criteria.

There are two areas of designated critical habitat in the Preserve. The northern area includes Ivanpah Valley, south of Nipton Road, including the areas north, west and south of Cima Dome, extending up to Interstate 15. This area totals approximately 492,360 acres (769 square miles) and is within the Eastern Mojave Recovery Unit. The second area of the park that contains desert tortoise critical habitat is the Fenner/Clipper Valley. This area contains 280,103 acres (438 square miles) of federal land. This habitat is also within the Eastern Mojave Recovery Unit. These two areas of critical habitat combined total about 772,463 acres (48%) of the Preserve designated as critical habitat for this species (FWS 1994). Critical habitat also extends north of the Preserve onto BLM lands in the Shadow Valley area up to the southern slope of the Kingston Range and on adjoining BLM lands north of Nipton Road up to Ivanpah Dry Lake. There are also large areas of critical habitat to the south and east of the Fenner/Clipper valley area in California and Nevada.

#### **Mohave tui chub (*Gila bicolor mohavensis*) — FE, CAE**

The Mohave tui chub (*Gila bicolor mohavensis*) is in the minnow family and can reach over 10 inches in length. The Mohave tui chub was listed as an endangered species in 1970 by the U.S. Fish and Wildlife Service. The Mohave tui chub is the only fish native to the Mojave River basin in California. The arroyo chub (*Gila orcutti*) was introduced into the Mojave River system in the 1930s. This exotic chub successfully hybridized with the Mohave tui chub, and by 1970 the latter fish species was believed to have been eliminated by this process of introgression. A small population of genetically pure Mohave tui chub was found at a small pond (6 feet deep and 9 feet in diameter) at Soda Springs on the western bank of the dry Soda Lake (FWS 1984). Since its rediscovery, populations have been successfully introduced to constructed ponds at Soda Lake, Camp Cady, and China Lake Naval Air Weapons Station. The total estimated population at these four areas is between 10,000 and 20,000 fish (Mohave tui chub recovery team meeting, November 1996).

The Mohave tui chub is morphologically similar to the Owens tui chub (*G. b. Snyderi*) and the Lahontan tui chub (*G. b. obesa*) (FWS 1984). A genetic study, completed in September 1997, found that the Mohave tui chub is a distinct subspecies (May et al. 1997).

#### **Desert Bighorn Sheep**

Native populations of Nelson's bighorn sheep (*Ovis canadensis nelsonii*) are found in most of the mountainous terrain of the park, with population estimates as of 1994 at between 400 and 675 or more animals (Torres, S. G. et al. 1994). The population is not listed by the U.S. Fish and Wildlife Service or the state, but is sensitive due to the fragmentation of habitat throughout its range. Mojave National Preserve is also one of the few places in California where bighorn sheep hunting is allowed. Limited hunting of bighorn sheep began in 1987 (BLM 1988). A limited number of permits to hunt bighorn sheep are issued each year by CDF&G through a lottery system.

**TABLE 10: BIGHORN SHEEP POPULATIONS IN OR NEAR MOJAVE NATIONAL PRESERVE**

<b>Metapopulation*</b>	<b>Population</b>	<b>Population Status**</b>	<b>Population Size Class</b>
Central Mojave	Old Dad/Kelso/Marl	N	201–300
	Granite	N	<25
	Providence	N	25–50
	Wood/Hackberry	N	51–100
	New York	N	<25
	Castle/Hart/Piute	N	<25
Central North Mojave	Clark	N	101–150
	Soda	E	0
<b>Population Range</b>			<b>400– 675</b>

From, Torres et al. 1994, “Status of Bighorn Sheep in California, 1993, 1994 Desert Bighorn Council Transactions, pp. 17–28

\* Metapopulation = Population management areas

\*\*N = Native R = Reintroduced E = Extirpated

++ From T. Egan, pers. comm., 1997

### **Riparian Dependent Bird Species**

southwestern willow flycatcher (*Empidonax trailli extimus*)—FE, sp. level CAE

least Bells vireo (*Vireo bellii pusillus*)—FE

California/western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)—CAE

Mesic habitats in the planning area are not noted for high numbers of the riparian obligates listed above (relative to their known ranges), but such habitats do provide a degree of essential foraging and nesting habitat. To date, other than along the Colorado River, the study of the vireo and flycatcher in the desert have been concentrated along the Mojave River.

In May 1986, *Vireo bellii pusillus* was federally listed. Its critical habitat was designated in February 1994. Endangered status took effect for *Empidonax trailli extimus* in March 1995, and a final determination of critical habitat was made in July 1997. Listing of the willow flycatcher by the state of California is at the species level. Federal recovery planning is underway for both the vireo and flycatcher. There is no critical habitat for either species in Mojave National Preserve.

The western yellow-billed cuckoo, listed by the state of California as endangered since 1988, generally requires a broader stand of riparian growth than the vireo or flycatcher. The loss of riparian habitat is the major common factor influencing the decline of all three species. The cuckoo does not appear to be affected by brood parasitism by the brown-headed cowbird (*Molothrus ater*), which is a severe problem for the vireo and flycatcher. In this behavior, cowbirds introduce their offspring to the nest and care of a host bird species, competing directly with the success of the host’s young and sometimes eating or ejecting the host’s eggs (Thelander 1994).

### **Sensitive Habitats**

**Coastal Sage:** Several canyons, located within the New York Mountains, contains a unique assemblage of plants and an interesting blending of plant communities not found elsewhere within the

Preserve. Besides the small stand white fir trees (see section below), an “enriched” pinyon-juniper-oak woodland, or interior chaparral community, is found in Caruthers, Keystone, and Live Oak Canyons. Manzanita (*Arcostaphylos* spp.) oaks (*Quercus* spp.), silktassel (*Garrya* spp.), single-leaved ash (*Fraxinus anomala*), western service-berry (*Amelanchier utahensis*), holly-leaved redberry (*Rhamnus ilicifolia*), yerba santa (*Eriodictyon augustifolia*) desert olive (*Forestiera neomexicana*) all species usually found in coastal associations, are documented in these canyons. Coastal sage is typically a fire tolerant community, supporting intense fire due to volatile compounds in the plants, but recovering over time to a similar community. Caliculous scrub, a community that grows only highly calcic soils, is also found within the New York Mountains.

**White Fir Populations:** Small populations of Rocky Mountain white fir (*Abies concolor concolor*), relict populations from the late Pleistocene-early Holocene period can be found in the upper reaches of the New York Mountains and on Clark Mountain. These pockets of white fir trees probably exist due to favorable conditions at the microsite level, with humidities in these small areas sufficient to favor sufficiently low evapotranspiration rates (Latting and Rowlands 1995). These north-facing canyons are moister and cooler than the surrounding desert and shelter these relict stands. White fir stands would be protected from wildfire, since it is not tolerant to extremes in heat and has a thin outer bark. Its seedlings need shade to germinate and establish, so if a stand were destroyed by fire, conditions for new tree growth would not be favorable.

**Joshua Tree Woodlands:** The most obvious feature of Cima Dome, next to its unique geological form, is the Joshua tree (*Yucca brevifolia jaegeriana*). The Joshua tree woodland covering the dome and surrounding areas is considered to be the largest and most dense stand within the tree’s range, covering in excess of 150 square miles and probably containing more than a million trees. Although methods of aging of the trees are still subject to some disagreement, some of the trees with base diameters in excess of three feet and heights of 30 feet or more, may be 500–1,000 years old. The Joshua tree forest on the Cima Dome has not been surveyed and mapped for age distribution, nor are there any quantitative data to indicate the status of new seedling recruitment into the population. Joshua trees are susceptible to wildfire, and aboveground portions of the plants are often killed.

### Other Unusual Plant Communities

**Caliculous Scrub:** Vegetation associated with limestone and dolomitic outcrops occurring in the Providence, New York, and Clark mountains. Characterized by the occurrence of many uncommon plants.

**Sagebrush Scrub:** Great Basin sagebrush (*Artemisia tridentata tridentata*) occurs in the Round and Gold Valleys in the Mid Hills area. This community is typical of the Great Basin desert to the north and is one example of the intersection of the three great southwestern deserts.

**Desert Grassland:** A large expanse of desert grassland containing about 20 species of perennial grasses is found in eastern Lanfair Valley.

**Shadscale Scrub:** A stand of *Atriplex confertifolia* occurs at Valley Wells and is characteristic of alkaline soils of the Great Basin Desert.

**Kelso Dunes:** The Kelso Dunes, reaching over 600 feet above the surrounding terrain, are the largest accumulation of sand within the Devil’s Playground area. The Kelso Dunes are one of six “booming” dune systems in the entire world. These are dunes that emit audible booming, humming, or buzzing sounds as they shift. Sand from the Kelso Dunes originated in Afton Canyon fan at the southern end of Soda Lake (Lancaster). They also support psammophytic, or sand-growing plant communities and a

diverse, but largely unseen contingent of diverse and sometimes rare invertebrates. Dune invertebrates include arthropods such as scorpions, roaches and beetles. Scorpions prey on smaller insects. Roaches and beetles depend on wind-blown organic material for both food and for nursery sites.

**Mojave Yucca:** The slopes of the Hackberry, Woods, and Providence mountains support stands of very tall (up to 25 feet) *Yucca schidigera*.

**Succulents (Cactus Gardens):** Many slopes of the Preserve mountains support extensive stands of succulent shrubs, including barrel, silver cholla, buckhorn cholla, hedgehog, Mojave mound, beavertail, and prickly pear cacti.

**Riparian:** Piute Creek, the Preserve's only perennial stream, and the ephemeral Bull Canyon's stream in the Granite Mountains supports a lush stand of cottonwoods, willows, and other riparian vegetation. Seeps and springs are relatively scarce and sometimes support riparian species. Studies have shown riparian areas, including large washes, to be extremely important for ecosystem biodiversity and sustainability.

**Mesquite:** Mesquite thickets, which indicate a high water table, occur in substantial numbers near Crucero, south of Soda Lake. Illegal offroad vehicle usage from the adjacent BLM Razor OHV area poses threats to this community.

**Smoke Tree:** The smoketree (*Dalea spinosa*) is a species reaching its northern distribution in or near the Preserve. This Sonoran desert plant occurs in washes primarily along interstate 40, although it is also found in the Mojave River drainage west of the Preserve. A large assemblage of smoketree in Piute Valley was recognized by the Bureau of Land Management as a Sensitive Unusual Plant Assemblage.

## Introduced Species

Exotic (nonnative) species can include both plants and animals. They are generally defined as those species that occur in a given place as a result of direct or indirect, deliberate or accidental actions by humans. The exotic species introduced because of such human action would not have evolved with the species native to the place in question and therefore would not be a natural component of the ecological system characteristic of that place. There are 60 known nonnative plant species that have been identified in the Preserve. Examples of exotic species in the Preserve are wildlife such as burros and chukar, and plants like tamarisk, goat-head thorns, halogeton, cheat grass and Russian thistle.

### Burros

Wild burros inhabiting the United States are descendants of the Nubian and Somali wild ass (*Equus asinus*) of northeastern Africa. The burro was domesticated over 5,000 years ago in Africa and used as a beast of burden. Spanish explorers introduced the burro as a domesticated animal to North America in the 16th century. Wild burro populations became established in the arid southwest as a result of domestic escapees and animals intentionally turned loose when they were no longer needed.

From about 1920 to the 1960s, burro populations were kept at low levels by government agencies like the National Park Service and by the public through organized and random shooting of the burros. These efforts to reduce or eliminate feral burros from national park lands were park managers' response to the burros damage of park resources and their changing of the ecological composition at the expense of the park's native biotic communities.

In the 1950s the states of Arizona and California passed burro protection laws that limited the killing of these animals by private citizens. In the late 1960s, Grand Canyon National Park was prevented by public outcry from continuing the 40-year custom of shooting burros (NPS, 1979). In 1971, the Wild and Free-Roaming Horse and Burro Act was passed by the U.S. Congress. This act limited the killing of horses and burros on public lands administered by the Bureau of Land Management and the U.S. Forest Service, and attempted to establish a “thriving ecological balance” for horses and burros within their ecosystems. This law does not apply to NPS lands.

Since the 1971 Wild and Free-Roaming Horse and Burro Act, burro populations have thrived in the deserts of the southwestern United States, and they have had numerous impacts on these ecosystems. Documented impacts on plant communities, soils, wildlife, and water quality are numerous (see Douglas and Hurst, 1993, for a complete review). Burros are prolific breeders; herd sizes can increase at rates ranging from 11 to 29 percent per year (Ruffner et. al., 1977; Woodward, 1976). In a review of feral burro literature, Douglas and Hurst (1993) state that “wide-spread observations” by field researchers indicate rates of increase =20% per year. Indeed, annual burro population growth rates in Bandelier National Monument were observed to be 29% (Morgart and Ohmart, 1976). Predators, diseases, and other natural forms of population control in most areas where burros have been introduced have been inadequate to control these population increases. Consequently, periodic captures and adoptions have become the standard procedures by which populations are controlled.

An adult burro eats 17 pounds of forage per day, or about 6,000 pounds per year; it drinks about 2,000 gallons of water per year. Native plant species are being eliminated from their place in the natural plant community; competition for forage is adversely affecting sensitive species; and elimination of food, water, and cover is impacting the desert bighorn sheep. Of particular concern to the National Park Service are the impacts of feral burro herds on populations of the threatened desert tortoise (*Gopherus agassizii*). Burros compete with the tortoise for grasses and forbs. Over half of Mojave’s 1.6 million acres have been designated by the U.S. Fish and Wildlife Service as *critical desert tortoise habitat* (Fish and Wildlife Service, 1994). Mojave’s critical habitat constitutes a significant portion of the tortoise’s total range. The U.S. Fish and Wildlife Service Recovery Plan for the desert tortoise specifically lists the removal of feral burros from critical habitat as an important management strategy for population recovery. So, the long-term success of tortoise recovery could depend in part upon the successful removal of Mojave’s burros.

A survey conducted in September 1996 estimated there were 1,415 burros in the surveyed portion of Mojave (National Park Service, 1997). This figure was produced from mark-recapture estimates derived from over 200 hours of helicopter aerial surveys. The areas chosen for the survey included approximately 985,000 acres of the 1.6 million-acre park. Funds limited the amount of land that could be surveyed; therefore, the study targeted previous BLM Herd Management Areas.

Since the survey was conducted, burro distribution has been discovered to be more extensive than originally determined. The number of burros estimated to exist within the Preserve outside of the original study area, based on casual observations by the park’s field biologist, is at least a few hundred burros. Although an exact number cannot be determined unless a new survey is conducted, for planning purposes, a revised population estimate of 1,650 animals is believed to have existed in Mojave at the time of the 1996 survey.

To plan the burro removal program in Mojave, annual population increases due to reproduction are calculated. Empirical evidence indicates that burro herd sizes can increase at rates ranging from 11 to 29 percent per year (Douglas and Hurst, 1993; Morgart and Ohmart, 1976; Ruffner et. al., 1977; Woodward, 1976). Experience at Mojave suggests that a reproduction rate at the upper end of this spectrum is most representative of Mojave burro herds, as indicated by:

- Results of the 1996 Mojave survey showed that “when the reproductive rate is looked at as a percentage of the adult population accompanied by colts, the values...averaged 25.8%” (National Park Service, 1997, page 7).
- Of the 520 burros captured in Mojave during calendar year 1998, approximately 50% were female. Of those females, nearly every animal was either pregnant or accompanied by a colt<sup>1</sup>.

Taking into account these indicators of high reproductive rates, it is therefore reasonable to assume a herd reproduction rate of 25% for estimating the size of the Mojave burro population during the multiyear capture and removal program.

Before the passage of the California Desert Protection Act, the Bureau of Land Management (BLM) administered herd management areas (HMAs) in what is now the Mojave National Preserve. Their prescribed number of burros for what is now the main unit of the Preserve was 130 animals. On February 28, 1995, the superintendents of Death Valley National Park and Mojave National Preserve signed an agreement with the BLM to an interim management policy for burros on lands formerly managed by the BLM. The policy is to maintain the BLM-approved management levels until a final decision is derived through the formal planning process, which includes the preparation and public review of this document. That level is 130 burros for Mojave National Preserve. The interim policy will expire with the signing of the record of decision for the final environmental impact statement.

Mojave is currently receiving Natural Resource Preservation Program (NRPP) project dollars to remove burros. NRPP funding is spread over a three-year period, from 1999–2001. It is anticipated that these funds will be used to remove burros to the BLM’s prescribed management level, and then to implement the general management plan’s selected alternative for the animals.

In September 1997, Mojave captured and removed 600 burros; between June and October 1998, 520 burros were captured and removed; and in 1999, Mojave captured and removed 650 animals; for a total of 1,770 burros removed from Mojave during the two and one-half year period. Assuming a 25% average annual population growth, plus these three years of captures, there were approximately 915 burros in Mojave at the beginning of calendar year 2000, which is 785 animals greater than the BLM’s prescribed number of 130. It should be noted that, due to population reproduction, reduction of this herd from 915 burros to 130 animals will require the removal of more than 785 animals.

**TABLE 11: FERAL BURRO POPULATION ESTIMATES FOR MOJAVE NATIONAL PRESERVE.**

<b>Fiscal Year</b>	<b>Population Estimate Beginning of F.Y. (Oct. 1)</b>	<b>Growth Rate (25%)</b>	<b>Removals</b>	<b>Population Estimate End of F.Y. (Sept. 30)</b>
1997	1,650	+ 413	- 600	1,463
1998	1,463	+ 366	- 520	1,309
1999	1,309	+ 327	- 721	915
2000	915	+ 229	- 513	631

data as of 6/6/00

<sup>1</sup> This observation implies an even higher reproductive rate than the 1996 survey suggests, but these numbers are not from a representative sample, so generalizations cannot be made about the entire population of Mojave burros.

### Rocky Mountain Mule Deer

The California Department of Fish and Game introduced the Rocky Mountain mule deer (*Odocoileus hemionus hemionus*) into the New York and Providence Mountains of the Preserve in February and March of 1948 from Arizona (Dasmann 1968). Nine bucks and 31 does were released. The first authorized hunt of this population was in 1955. Buck return cards indicate that on average about 31 deer have been taken per year since 1988 (CDF&G 1991). The population has remained relatively stable since the first introduction.

Mule deer are native to the Mojave Desert and occur in nearby mountain ranges. Although the deer in Mojave were introduced by the California Department of Fish and Game, anecdotal information suggests that a resident population may have occurred in the pinyon-juniper and sagebrush habitat prior to these introductions. It is likely that these deer have interacted and bred with adjacent herds over the last 50 years and may now be genetically similar. DNA studies would help to resolve this apparent information discrepancy.

### Chukar

The chukar (*Alectoris graeca*), an upland game bird popular among hunters, was first introduced into California (from India) in 1932 (Mallette c.1970). Between 1932 and 1955, more than 52,000 birds were released by the California Department of Fish and Game (Mallette c.1970). The birds prefer rocky open hills and flats. Sightings have been reported from below sea level to above 12,000 feet in the White Mountains and Sierra Nevada. The animal is abundant in parts of the Preserve.

### Nonnative Plants

There are 60 known nonnative plant species that have been identified in the Preserve. Tamarisk or salt cedar (*Tamarix ramosissima*), Russian thistle, and introduced annual grasses (from Europe and Asia) are some of the more pernicious exotics within the Mojave National Preserve. These species often out-compete native vegetation, subsequently eliminating or displacing natives and associated native animals. Annual plants such as introduced grasses and Russian thistle often cause an unnatural increase in the amount of dried material available as wildfire fuel.

Salt cedar, an introduced shrub or small tree 5 to 20 feet tall, is an opportunistic invader of moist areas. Both the Bureau of Land Management and the National Park Service have ongoing control programs that are attempting to manage this invasive plant. Continuing control is needed to prevent this weedy tree from outcompeting and eliminating native vegetation. A larger, less invasive relative, the athel (*T. Aphylla*), has been planted (typically as a windbreak or sand-break) in a number of locations in the Preserve (e.g., near Kelso Depot). This species does not spread easily and is not considered a threat. Some of these trees may be considered part of the historic landscape would be evaluated during planning efforts for those sites.

Russian thistle (commonly called tumbleweed) is common in many disturbed areas in Mojave National Preserve, such as at old mining sites and along roadsides. Introduced annual grasses such as *Bromus* and *Schismus* species are serious pests when mature (Hitchcock and Chase 1971). "The narrow, sharp-pointed minutely barbed florets (or fruits) with their long rough awns work into the eyes, nostrils, and mouths of stock, causing inflammation and offer serious injury" (Hitchcock and Chase 1971). The increase of these grasses throughout much of the arid west is believed to be an important contributing factor in the increase in desert wildfires, which were uncommon at one time.

## **CULTURAL RESOURCES**

### **BACKGROUND**

Various cultural resources studies have examined archeological resources in the Mojave National Preserve region. The most significant studies include: Davis, Brown, and Nichols, *Evaluation of Early Human Activities and Remains in the California Desert* (1980); Warren, Knack, and Warren, *A Cultural Resource Overview for the Amargosa-Mojave Basin Planning Units* (1980); Brooks, Wilson, and Brooks, *An Archaeological Inventory Report of the Owlshead/Amargosa-Mojave Basin Planning Units of the Southern California Desert Area* (1981); and King and Casebier, *Background to Historic and Prehistoric Resources of the East Mojave Desert Region* (1981).

Various cultural resource studies and publications have examined historic resources in the Mojave National Preserve region. The most significant studies and publications are Westec Services, Inc., *A History of Land Use In the California Desert Conservation Area* (1978); Warren, Knack, and Warren, *A Cultural Resource Overview for the Amargosa-Mojave Basin Planning Units* (1980); Norwood and Bull, *A Cultural Resource Overview of the Eureka, Saline, Panamint and Darwin Region, East Central California* (1980); King and Casebier, *Background to Historic and Prehistoric Resources of the East Mojave Desert Region* (1981); Vredenburg, Shumway, and Hartill, *Desert Fever: An Overview of Mining in the California Desert* (1981).

### **PREHISTORIC RESOURCES**

#### **Pleistocene Era**

Although evidence of human occupation in the Mojave Desert region during the Pleistocene Era remains a controversial subject, some researchers have suggested a pre-projectile point horizon where a crude flaking technology was used and where the ancient lakeshores may have provided a favorable environment for human occupation.

#### **Lake Mojave Period, 10,000–5000 B.C.**

The Lake Mojave complex, which most archeologists consider to be a Paleo-Indian assemblage, is also thought to be ancestral to the early Archaic cultures of the Pinto period. This complex has become the comparative unit for “Early Man” in the Mojave Desert, and similarities to sites in the western Great Basin and to the San Dieguito complex of southern California have been noted.

Sites of the Lake Mojave period are nearly always limited to the surface, and it is possible that two or more assemblages are represented at some of these sites. Many of the sites are associated with shoreline features of Pleistocene lakes, such as the shorelines of extinct Lakes Mojave and Manly, and near springs.

#### **Pinto Period, 5000–2000 B.C.**

Dramatic environmental changes came to the Mojave Desert with the end of the Pleistocene Era, characterized by harsh climatic conditions with higher temperatures and lower precipitation. Lakes and rivers dried up, and available resources were much reduced. Human adaptation to these new environmental conditions appears to be represented by the Pinto period assemblages.

The Pinto sites are most often limited to surface manifestation or have poorly developed middens with relatively low artifact density. They appear to have been seasonal camps of small groups of highly mobile people. The small number of Pinto period sites, together with their apparent temporary occupation of hunting large and small game and collecting vegetable resources, suggests that the

population was sparse and poorly adapted to the increasingly arid conditions of the desert environment. During particularly arid periods, the inhabitants probably withdrew to the margins of the desert and to perennial springs and microenvironments less affected by the overall climatic deterioration, and during more moist periods they likely expanded their territory in the lower desert areas to take advantage of the shallow lakes, marshes, and springs. During the later part of the Pinto period, when the Mojave Desert was at its most arid, the population of the Mojave Desert seems to have decreased, although a mosaic of microenvironments permitted localized habitation throughout the desert.

### **Gypsum Period, 2000 B.C.– A.D. 500**

The beginning of the Gypsum period coincided with the commencement of a more moist climatic era, often referred to as the Little Pluvial, about 2000 B.C. The Gypsum period was a time of intensive occupation of the present-day Mojave Desert area coupled with a broadening of economic activities and increasing contact with the California coast and the Southwest. The bow and arrow were introduced late in this period, making hunting more efficient.

Although hunting continued to be an important economic pursuit during the Gypsum period, milling stones and handstones became common during this period, indicating increased use of plant foods and reliance on hard seeds. Mortars and pestles and manos and metates are reported at Mesquite Flat in Death Valley and on the Amargosa River, where they dated between 2080 and 3250 B.C. These sites are located near or in mesquite groves, suggesting that the processing of mesquite pods with the mortar and pestle may have become an important element in the subsistence system.

Generally, the Gypsum period was a time in which the Mojave Desert population incorporated new technological items and ritual activities and increased socioeconomic ties through trade. Because of these new means of adaptation, the return of arid conditions toward the end of the Gypsum period had relatively little effect on the Mojave Desert's population density and distribution.

### **Saratoga Springs Period, A.D. 500–1200**

In the northern Mojave, from Death Valley to the Sierra Nevada, the sites of the Saratoga Springs period appear to exhibit cultural continuity with the Gypsum period, change being most apparent in the reduction in size of projectile points as a result of the introduction of the bow and arrow. During the Saratoga Springs period, there appears to be a refinement of adaptation to the arid environment of the northwest Mojave, and presumably the beginnings of the eastward expansion across the Mojave of Numic-speaking groups, who were the ancestors of the historic Shoshone and Paiute who inhabited the region at the time of Euro-American contact.

Essentially, the same assemblage was present across the Mojave Desert north of the Mojave River. However, Basketmaker-Pueblo influences increased with Anasazi occupation of the lower Virgin and Muddy Rivers. Research suggests that the Anasazi controlled turquoise mines near Halloran Spring in the east-central Mojave between about A.D. 700 and 900, followed by Hakataya peoples, who withdrew about A.D. 1200–1300. Finally, the Southern Paiute used the area in late prehistoric times. The mining of turquoise resulted in Anasazi influence in much of the eastern Mojave, because small parties of these Virgin and Muddy River villagers used the region for intermittent and seasonal foraging. The extent of these forays has not been determined, but it appears to have been considerable, particularly in well-watered areas such as Las Vegas Valley, Ash Meadows, and the Spring Mountains. The area of this influence can be mapped by the distribution of Anasazi sherds occurring in considerable frequency at sites in southern Nevada and in California as far west as the Cronese Basin, west of Soda Lake. Anasazi influence set the eastern Mojave apart from the remainder of the desert.

During this time, the Mojave River also developed as a trade route between the Colorado River and the California coast. As a result of this trade, the ceramic and projectile point styles of the lower Colorado River spread through the Mojave River Valley, along with shell beads and ornament styles from the coastal region.

The cultural development of the Mojave Desert south of the Mojave River and Providence Mountains diverged from that in the northern area during this period. Few points of the Rose Spring series and virtually no Anasazi pottery occur in the southern Mojave. Artifact types, such as knives, drills, milling stones, mortars and pestles, stone pipes, bone awls, and shell and stone ornaments show close similarities to their counterparts in the later pottery-bearing sites along the Mojave River.

### **Shoshonean Period, A.D. 1200–Euro-American Contact**

The Shoshonean period clearly anticipates the historic Native Americans with evidence of bow and arrow hunting, exploitation of plant resources using milling stones, and use of circular houses. The Anasazi influence faded after A.D. 1200 as a result of changes in climatic conditions, population movements, settlement patterns, social organization, and trade alignments.

The Mojave River Valley and the southern Mojave continued to be influenced by the well-developed trade system in which the Antelope Valley people of the western Mojave functioned as middlemen between California coastal and interior populations. Village sites on the upper Mojave developed, apparently dependent in part on the trade with the coastal region. Compared with other parts of the desert region, these villages appeared to be more elaborate; there are house pits, more abundant shell beads and ornaments, and the painting of utilitarian items such as metates with several different colors of pigment. Late in the Shoshonean period (ca. A.D. 1650), the trade networks involving both the Mojave River and Antelope Valley peoples appear to have been disrupted, bringing an end to the villages in Antelope Valley and reducing the intensity of activity along the Mojave River.

## **HISTORIC RESOURCES**

### **Overview**

There is an impressive inventory of historic resources in the Mojave National Preserve region. The mountains and valleys contain sites associated with early Spanish and American exploration and survey of the vast Mojave Desert region, and the area is laced with remnants of prehistoric and protohistoric Native American trails as well as Euro-American trails, wagon roads, railroads, highways, and other early transportation arteries. The region contains numerous remnants of abandoned mining operations, sites of settlements (some of which are long gone and nearly forgotten), railroad grades and railway structures, and sites associated with military operations against the Native Americans. Fencelines, water tanks, and corrals testify to a continuing ranching-grazing industry. Many of these may be historical structures with associated contributing features and should be recognized as such. Scattered remains of homesteads tell of a time when dryland farming was attempted in this arid land; and the outlines of military camps are reminders of the days during World War II when American troops trained for military campaigns in other parts of the world.

### **Exploration**

The first Euro-American exploration expedition to enter the Mojave Desert region was led by the Spanish priest Francisco Garces during 1775–76. Garces, a Franciscan stationed at San Xavier del Bac near present Tucson, Arizona, accompanied Captain Juan Bautista de Anza on the latter's second expedition to California as part of the Spanish effort to settle Alta California. After Anza's main party crossed the Colorado River near present Yuma, Garces, accompanied by Indian companions, attempted to find a new trade and communications route between the Spanish settlements in Alta

California and the upper Rio Grande Valley in New Mexico by traveling up the Colorado as far as the Mojave villages, and then with Mojave Indian guides crossing the Mojave Desert on what would become known as the Mojave Indian Trail through present-day Mojave National Preserve, and eventually arriving at Mission San Gabriel near present Los Angeles. Later, still accompanied by Mojave guides, he returned to the Mojave villages, crossing the Mojave Desert over a more northerly route through the present Preserve.

After the Mojaves committed various depredations against the Spanish settlements, Lieutenant Gabriel Moraga led a force of about 50 men to strike the Mojave homeland. Leading his force down the Mojave River and eastward into the desert, the Moraga expedition progressed one full day's travel east of Soda Lake before being forced to turn back by desert conditions.

In 1826, Jedediah Strong Smith, credited with being the first United States citizen to reach the Mexican settlements in California overland, crossed the Mojave Desert via the Mojave villages on the Colorado River and the Mojave Indian Trail. He made a repeat trip in 1827, and during the next several years a steady flow of American "mountain men," including prominent personalities such as William Wolfskill, George C. Yount, Christopher "Kit" Carson, and Ewing Young would enter California via the Mojave villages and the Mojave Indian Trail. For the most part, these early travelers were fur trappers looking for new untapped fields.

During 1853–54, informal exploration by Francois X. Aubry, and more extensive expeditions by U.S. Army engineer Lieutenants Robert S. Williamson and Amiel W. Whipple, traversed the present-day Preserve in attempts to identify the most practicable route along the 35th parallel for a transcontinental railroad across eastern California. These explorations resulted in the acquisition of significant topographic and scientific information about the 35th parallel route.

George M. Wheeler's extensive topographic and scientific surveys west of the 100th meridian for the U.S. Corps of Topographical Engineers during the 1870s earned him national recognition and made an invaluable contribution to the knowledge of the West. During his first major expedition in 1871, Wheeler's men reconnoitered some 72,250 square miles, covering portions of lower Nevada, eastern California, southwestern Utah, and northwestern, central, and southern Arizona, including the Mojave Desert. The success of this expedition enabled Wheeler to obtain congressional support for the extensive program of exploration that he would undertake throughout the rest of the decade. During 1875 his detachments again penetrated Death Valley via Darwin Canyon and Panamint Valley, and the Mojave from the south edge of Death Valley to the Colorado River. The Wheeler surveys recorded data on archeology, geology, botany, zoology, and Native Americans and developed topographic maps of the region.

During the late 1890s and early 1900s, state and federal government geologists arrived in the area that is now the Preserve to conduct the initial scientific studies of the area's geological formations and mineralogical potential. Surveyors from the U.S. Geological Survey mapped most of the area during the early 1900s, producing the first reliable topographic maps of the region. In 1909 Walter C. Mendenhall, who would later become director of the Geological Survey, issued a guide to the "watering places" throughout the eastern California–southern Nevada desert country, providing detailed information and maps on the main routes of travel and the location and description of irrigating and artesian waters and springs in the region.

## **Transportation**

The lands in the Preserve have served as an east-west transportation corridor across the eastern Mojave Desert since prehistoric times, spanning the range from Native American trails to travel by horse,

mule, wagon, railroad, and automobile. Variants of the Mojave Indian Trail, used by Native Americans for centuries, were followed by explorers, mountain men, and traders beginning during the late 1820s, establishing what would become known as the Old Spanish Trail.

Because sectional conflict that would ultimately lead to Civil War prevented the construction of a transcontinental railroad until the 1860s, attention turned to development and improvement of wagon roads and postal routes to connect “the States” with the lands in the American Southwest that the United States had acquired as a result of the Mexican War. During 1857–60 Edward F. Beale served as superintendent of a project to survey and improve a wagon road over the 35th parallel route from Fort Defiance, New Mexico (present northeastern Arizona), to the Mojave villages on the Colorado. As part of his work, Beale’s crews improved the Mojave Indian Trail through the eastern Mojave to Los Angeles. While making his wagon road improvements, Beale conducted his noted “camel experiment,” using camels that had been imported by the U.S. War Department during 1855–56.

By the summer of 1858, at least five emigrant wagon trains had attempted to use the new route to travel from New Mexico to Los Angeles. Encountering extreme hardships and attacks by the Mojave Indians at the Colorado River in August 1858, the emigrant trains were forced to return to New Mexico, halting use of the 35th parallel route as an overland transcontinental route. In response, Major William Hoffman led the “Colorado Expedition” against the Mojaves, arriving at their villages in late April 1859. The Mojaves surrendered to Hoffman’s superior force, and a post known as Fort Mojave was established on the east side of Beale’s Crossing of the Colorado. The post, which would remain until 1890, controlled the Mojave tribe and served as a depot for army operations in the eastern Mojave Desert in California, southern Nevada, and northwestern Arizona. Using government teams with civilian teamsters, wagon masters, and herders, Captain Winfield Scott Hancock, U.S. Army quartermaster in Los Angeles, supplied distant Fort Mojave via Beale’s wagon road, which has become generally known as the Mojave Road. The Mojave Road continued to serve as the major thoroughfare across the eastern Mojave until 1883, when a railroad was built across the desert from San Francisco via Daggett to Needles. During the 1870s immense herds of sheep and other livestock were driven over the Mojave Road to Arizona and New Mexico when new ranges were discovered that were becoming safe from Indian threats.

In 1860 Major James H. Carleton led the 1st Dragoons against the Southern Paiutes and Chemehuevis, commonly referred to as Pah-Utes, who had undertaken periodic attacks against wagon trains on the Mojave Road in the eastern Mojave in defense of their water sources, game, and traditional lifeways. During the course of his campaign, Carleton and the Indian peoples engaged in a series of running skirmishes at Old Dad Mountain, Marl Springs, the Providence and Granite mountain ranges, Kelso Dunes, and the Devil’s Playground. Carlton established an army post on the Mojave River, which he named Camp Cady, as well as a short-lived adobe redoubt at Soda Springs. Isolated depredations against wagon trains persisted after 1860, and when the Arizona Overland Mail used the Mojave Road as a postal route during 1866–68, the U.S. Army established relay posts across the desert at Soda Springs, Marl Springs, Rock Spring, and Piute Creek to provide escort riders for the mail carriers. Military authorities at Fort Mojave made peace with the Pah-Utes in 1867, and by 1870 the Indians had ceased to be a factor of concern to the growing numbers of Euro-Americans who were entering the region to establish mines and ranches.

During the early 1880s, the Atlantic and Pacific Railroad, owned in part by the Atchison, Topeka and Santa Fe, began construction along the 35th parallel route from the east. The Southern Pacific (closely linked with the Central Pacific and led by Collis P. Huntington, one of California’s major railroad magnates) began construction of a rail line southward from San Francisco to meet the Atlantic and Pacific at Needles. By April 1883 the Southern Pacific Line was completed across the eastern Mojave from Mojave to Needles, and in May the Atlantic and Pacific reached the opposite bank of the

Colorado. After a settlement between the two railroads, the Colorado River was bridged, and on August 9, 1883, the 35th parallel rail line was connected, thus opening a transcontinental route between California and Springfield, Missouri. This rail line, now owned by the Burlington Northern Santa Fe Corporation, would stimulate the economic and mining development of the eastern Mojave.

The Nevada Southern Railroad completed a line from Goffs to the mining settlement of Manvel in the New York Mountains by the summer of 1893. Reorganized as the California Eastern Railroad Company in 1895, the rail line was extended to the Ivanpah Valley in 1901–02. The Santa Fe took over the railway in 1902, and, during 1906–07, a branch line was constructed from Barnwell (formerly Manvel) to Searchlight, Nevada. That branch operated until 1923.

The San Pedro, Los Angeles, and Salt Lake Railroad, jointly owned by copper king William A. Clark (who established the company in 1901) and Edward H. Harriman of the Union Pacific Railroad (who had subsequently purchased one-half of the company's stock) constructed its tracks through the present Preserve in 1905, thus filling the last significant gap in transcontinental railroad lines from Salt Lake City to Los Angeles. Later, this "Salt Lake Route" to southern California, officially renamed the Los Angeles and Salt Lake Railroad, would be fully controlled by the Union Pacific, and the company would construct the extant mission revival style Kelso Depot in 1924 to serve as a hotel, restaurant, and office for train crews that provided 24-hour essential helper (engine) service 19 miles eastward from Kelso to the top of Cima Hill. Cima emerged as a small railroad community, featuring a wye on which the helper locomotives from Kelso could be turned to return to Kelso.

Construction of the depot was completed sometime between 1923 and 1924, after which rooms and a café served railroad workers for approximately 38 years as a railroad hotel, restaurant, and club for workers laying over between shifts. The café continued to operate until June 1985, when it was closed. The building remains an excellent and rare example of a mid-1920s Mission Revival style railroad station and employee housing of the Union Pacific railroad in California.

The depot stands as a remnant of the steam-powered locomotive era, when pusher engines were used to help trains get up over the steep Cima grade. The historical setting for the building continues with a minor amount of intrusions from modern structures within the area. The building has been nominated for the National Register of Historic Places. The National Park Service also completed a historic structure report in 1997 that records the historic details of structure and made recommendations for stabilization and renovation. This document provides extensive documentation on the depot.

During the early 1900s, Francis M. "Borax" Smith attempted to tap his Amargosa Valley borax properties near Death Valley with a traction road consisting of a rock-based wagon road from his newly developed Lila C. Mine to the California Eastern railhead at Ivanpah II (there were three settlements with the name of Ivanpah). After an abortive traction engine inaugural trip in April 1904, Smith determined to build the Tonopah and Tidewater Railroad, extending northward from Ludlow through the present Preserve region to Beatty, Nevada. Operating from 1907 to 1940, the railroad, along with its feeder lines, tapped the growing mining settlements in the present Preserve region.

With the emergence of the automobile age, efforts were initiated to develop a highway system across the United States. The Mojave Road served as the antecedent for the eastern Mojave portion of the "Ocean-to-Ocean Highway," sometimes referred to as the "National Old Trails Highway," which was constructed in 1914 between San Bernardino and Needles. Eventually this highway would become known as Route 66, a transcontinental road connecting Chicago with Los Angeles. The highway, which skirted the southern edge of the present Preserve area, was paved during the 1930s with funds and manpower provided by Depression-era public works agencies. Route 66 became a significant transportation artery during the Depression for people who wanted to leave the "Dust Bowl" to make a

new start in California. During the early 1970s, Route 66 was replaced by Interstate 40, and today the historic route, known as the National Old Trails Highway (determined eligible for listing on the National Register as an archeological district on April 26, 1993), serves as a nostalgic reminder of early automobile transcontinental travel.

The Arrowhead Trail, originally marked from San Bernardino via Las Vegas to Salt Lake City during 1914–16 and realigned as U.S. 91 during the late 1920s, was replaced by present-day Interstate Highway 15 during the 1960s. The interstate highway skirts the north edge of the Preserve.

## **Mining**

Gold and silver discoveries in the Colorado River Basin during the late 1850s and early 1860s sent hundreds of prospectors trekking across the eastern Mojave. As a result, prospectors discovered silver near Rock Spring in the present Preserve, and the Rock Spring (or Macedonian) Mining District was established in 1863. Silver deposits were soon discovered south of the Mojave Road in the Providence Mountains. For the next several years, mining camps proliferated in the Providence Mountains/Mid Hills/New York Mountains region, but the principal settlement was at Rock Spring, where the first post office in the present Preserve was established in 1866.

Although the mines in the Providence, Coso, and Slate ranges were vacated during the late 1860s because of trouble with Native Americans who sought to protect their traditional lands against the influx of Euro-American miners, the threat of Indian attack was removed by 1870, and prospectors began heading back to the abandoned portions of the desert. The Copper World was discovered near Valley Wells southwest of Clark Mountain about 1868, and silver was discovered south of Clark Mountain in 1869, resulting in establishment of the first site of Ivanpah, where much of the mining history of the eastern Mojave would be centered during the 1870s.

The prosperous national economy after the Civil War stimulated mining ventures in the California desert region, but the bank panic in 1873 and subsequent depression curtailed speculative capital for mining. The coming of the railroads during the 1880s stimulated new mining ventures in the eastern Mojave, particularly in San Bernardino County. Ivanpah, worked since 1870 for silver, was developed by two companies in 1880–81. Two prospectors from Ivanpah discovered the rich Bonanza King silver mine on the eastern slopes of the Providence Mountains, resulting in establishment of the Providence, which flourished during 1883–85, and Crow Town settlements.

Gold dominated mining ventures in the eastern California desert region during the 1890s, the Panic of 1893 resulting in political decisions favorable to gold interests over those of silver ventures. During this time, the widespread use of cyanide for treating gold ore sent many prospectors out to rework old dumps, and formerly unprofitable mines were reopened. These developments led to discovery and development of the Gold Bronze and Boomerang mines in the New York Mountains, the Telegraph Mine near Halloran Springs, and the Paymaster (Whitney) Mine near Old Dad Mountain southeast of Baker. The rise in copper prices during the 1890s resulted in reopening the Copper World Mine in 1898. Other mining ventures included development of copper, lead, and silver deposits in the New York Mountains, where the town of Vanderbilt was established, its name being chosen to signify the great wealth that the mines were believed to possess. The rich gold mine of Bagdad Chase, southeast of Ludlow and several miles outside the present Preserve, was discovered about 1898, and during 1904–52 this mine would produce more than \$6,000,000, or more than half of the recorded gold mined in the San Bernardino County since 1880.

Not until the early 1900s did conditions become conducive to large-scale hardrock mining operations in the eastern California desert region, prompted in part by the improvement of transportation facilities

and by a renewal of interest in gold and silver. The significant discovery at Goldfield, Nevada, in 1903 led to a stampede early the following year. During the fall of 1904, the mining rush extended southward to Rhyolite and soon spilled over into Inyo and San Bernardino counties in eastern California. A variety of metallic minerals were exploited in the Preserve area during the 1900s, including gold (Castle Mountains and Old Dad Mountain); copper (Vontrigger Hills, Clark Mountain); and lead, zinc and silver (Mid Hills, [especially the Death Valley Mine], Mountain Pass). This activity resulted in the formation of boomtowns whose progress paralleled for a time the maturation of Goldfield, Tonopah, and Rhyolite in Nevada. Ephemeral mining camps, such as Vontrigger Camp, Goldbend, Gold Valley, Gold Park, Dawson, Kewanee, and Hart, sprang up throughout the desert region. These mining ventures flourished until the financial panic of 1907, which resulted in an immediate slowdown of work and often total cessation of mining activity.

Although the inflationary 1920s put a damper on new mineral discoveries and mining development in the California desert, some mining activity continued. Since the early 1920s, clay used for ceramic purposes has been mined in the Castle Mountains. During 1924–25, gold was discovered north of Goffs on the south slope of Hackberry Mountain, and a new Vontrigger camp emerged.

The 1930s witnessed a revival of gold mining in the desert. Although the major discoveries occurred in Kern County, older districts, such as the Vanderbilt, experienced revivals. Prospecting was conducted where gold was known to have occurred, and some new discoveries were made as a result of this heightened interest.

The United States recovered from the Depression largely as a result of the worldwide demand for industrial and military-related products with the onset of World War II. Factories were placed in full production to turn out war materials, and the government paid premium prices for minerals such as tungsten, antimony, manganese, iron, copper, lead, and zinc necessary for military industrial production. Among the mines in the present Preserve region that prospered during the war was the Kaiser Steel Company's Vulcan Mine northwest of Foshay Pass in the Providence Mountains which produced more than 2,000,000 tons of iron ore during 1942–48 to supply its new steel mill at Fontana. On October 8, 1942, the War Production Board issued Limitation Order L-208 on October 8, 1942, classifying gold mines (lode mines producing less than 1,200 tons in 1941 were exempt) as nonessential for the war effort and giving mine owners 60 days to cease operations.

Uranium fever, much like the gold fever of earlier days, swept the eastern Mojave during the mid-1950s. Tungsten prospecting revived after World War II, and a major talc industry that had begun during World War I (but had never thrived because of limited markets and remoteness of the deposits) revived. Talc has also been mined in the Kingston Mountains region, and cinders have been quarried from the Cinder Cones and Lava Beds (Aiken Mine) areas southeast of Baker. Rare earth minerals have been mined on a large scale in the Mountain Pass area southeast of Clark Mountain. Periodic gold excitement has resulted in reactivation of gold mining operations in the eastern Mojave, including the Vanderbilt Mine in 1968 and the Bagdad-Chase Mine during the early 1970s.

### **Ranching/Homesteading**

Throughout the eastern California desert region, little oases with rich pockets of ground could become for a time more profitable bonanzas than most of the surrounding mineral lands. These isolated patches of fertile soil and perennial springs could produce crops of vegetables, fruit, and hay or fatten a herd of beef cattle, providing quick fortunes for the homesteader or rancher as long as the neighboring mining camps boomed. Although most ranchers held 160-acre homestead claims, they were usually able to irrigate only a fraction of that, while their stock ranged freely for miles beyond. The proximity of ranches and mining camps determined the profitability of both, but ultimately it was

the size of the ore pocket that limited the size of the salable crop, so as the mines went from boom to bust, so did the ranches.

The natural fecundity of watered land in the Mojave Desert region had long been demonstrated by Native Americans, who raised crops of corn, beans, melons, and squash around some of the springs and seeps. Miners who established the Rock Spring Mining District in 1863 were likely the first to maintain cattle and horses for extended periods in the east Mojave. Military garrisons and mining settlements in the region would continue to provide a market for fresh milk, meat, vegetables, and fruits.

The Rock Springs Land and Cattle Company was incorporated in 1894, consolidating the earliest ranches in and near the present Preserve (the Kessler Springs Ranch was the first, dating from the 1870s), and during subsequent years it extended its cattle operations over much of the eastern Mojave and into southern Nevada. The company, headquartered in the present Preserve, spent large sums to establish claims for exclusive use and improvement of the area's water sources. By 1920 the ranch would have nearly 10,000 head of cattle on its more than 1,000,000 acres. The ranch remained the dominant force in the cattle industry in the east Mojave until 1927, when one of its corporate members died and the company interests were subdivided. From 1927 until 1988, the OX Cattle Company, headquartered in Lanfair Valley and a direct descendent of the Rock Springs Land and Cattle Company, was the largest ranch in the east Mojave, operating over only a fraction of the area controlled by its predecessor, while other parts of the former range were operated as smaller ranches such as the Gold Valley, Overson, Kessler Springs, Valley View, and Blair ranches.

Beginning about 1910, settlers established homesteads and attempted dryland farming in the east Mojave, taking advantage of a cycle of particularly wet years. Although homesteads were established in many places, including Barnwell, Crucero, Goffs, and Pinto Valley, the majority (some 200–250 patents) were centered in Lanfair Valley, named for Ernest L. Lanfair, a merchant from Searchlight, Nevada, who filed the valley's first claim. After marginal success in drilling wells in Lanfair Valley, the settlers were forced to haul water over the Mojave Road from Government Holes, the one remaining water source in public ownership. By the late 1910s, dry years had returned, and many homesteaders had left the area. After the abandonment of the railroad between Barnwell and Searchlight in 1923, most of the remaining settlers moved out.

Dunbar, a black settlement established one mile north of the Lanfair townsite in Lanfair Valley by G. W. Harts and Howard Folke in 1911, boasted some 20 households at its peak. Harts tried an experiment in cotton cultivation, and Dr. C. H. Duvall planned construction of a home and industrial school for orphans on 40 acres of donated land, but the settlement was short-lived, its post office closing in May 1914.

### **Communications**

The first transcontinental telephone line, in operation from New York to San Francisco by 1915, crossed the present Preserve, but traces of the line have disappeared. Examples of significant communication lines in the Preserve area include the first powerline constructed from Hoover Dam to the Los Angeles area during the 1930s and an early telephone line that parallels the Santa Fe Railroad.

During the 1960s the American Telephone and Telegraph Corporation (AT&T) constructed an underground communications cable network throughout the United States. In the early 1980s the system was upgraded to accommodate current technological advances using Phillips technology; hence, it was renamed the P140 coaxial cable system. AT&T, which owns and operates approximately 709 miles of the system between Mojave, California, and Socorro, New Mexico, removed the

communications cable, marker posts, manholes, and repeater stations (incompatible with the company's current fiber optic network) in 1999 from a 220-mile right-of-way, that includes Preserve lands.

### **Federal Land Management**

Until the 1930s the public lands in the Preserve region were administered by the General Land Office, established in 1812 as a bureau in the U.S. Treasury Department and later transferred to the Department of the Interior in 1849. In 1934 the Taylor Grazing Act provided for the segregation of up to 8,000,000 acres (later raised to 142,000,000 acres) for grazing purposes under the jurisdiction of the newly established Grazing Service in the Interior Department. The Bureau of Land Management was established in 1946, uniting the functions of the former General Land Office and Grazing Service, and given responsibility for managing all public lands in the United States and Alaska, including its surface and subsurface resources.

### **Modern Military Training**

General George S. Patton selected much of the eastern Mojave and part of the Colorado Desert to train his troops for the North Africa campaigns during World War II. Although Patton left with his troops for North Africa in 1942 after less than a year's training, more than 1,000,000 men destined for many of the war's major battlefields were processed through the Desert Training Center, or the California-Arizona Maneuver Area (C-AMA) as it became known after its area was expanded to include lands east of the Colorado River. Headquartered at Camp Young near Indio, California, the C-AMA focused largely on lands south of the Preserve area. However, an important campsite was established in the southern portion of Piute Valley north of Arrowhead Junction at Camp Ibis (just east of the present Preserve), and a division-level encampment, known as Camp Clipper (also known as Camp Essex), was established at Goffs in June 1942 for 16,000 troops, including a segregated black division. Portions of Camp Clipper, which operated until June 1944, are in the Preserve, and the Clipper Mountains and Piute Valley on both sides of the California-Nevada border served as operating areas for the military training exercises.

Operation "Desert Strike," one of the largest exercises ever conducted by the U.S. Strike Command, involved more than 100,000 active and reserve men from all branches of the armed forces during training exercises between May 17 and 31, 1964. The men, along with a proportionate quantity of machines, guns, aircraft, and supplies, swarmed across the present Preserve from east to west, slashing hundreds of miles of new roads indiscriminately through the desert and leaving hundreds of tons of supplies and debris scattered throughout the area.

Today, nearly one-sixth of the Mojave Desert lies within military bases and reservations. Two of the military bases that are closest to the Preserve area are the Fort Irwin National Training Center and the Marine Corps Air Ground Combat Center.

### **Recreational Development/Tourism**

Recognition of the recreational and park values of the California desert was first undertaken during the pre-World War I years by such organizations as the Automobile Club of Southern California and the International Desert Protective Association, both of which encouraged their members to tour the desert and helped them do so with maps, sign programs, and lobbying campaigns for better roads. Since that time, the eastern California desert region has attracted an ever-increasing number of tourists interested in taking advantage of its recreational opportunities, including hunting, trapping, rockhounding, hiking, camping, and sightseeing.

During the 1870s, a public bathing establishment was built at Soda Springs, known as Soda Lake Station when it was a stage stop. In 1914 a religious group led by Pastor Charles T. Russell occupied Soda Springs, constructing five frame houses and attempting to mine gold in the nearby hills. In 1944 Curtis H. Springer arrived at Soda Springs and, finding it deserted, took possession of the land under a mining claim. He and his wife, Helen, developed the property into the “Zzyzx Mineral Springs and Health Resort,” which operated until 1974. With the exception of several modern structures, the site is much as the Springers left it. Transferred from the Bureau of Land Management to the National Park Service in 1994, the site is leased to the California Desert Studies Consortium of the California State University.

Mitchell Caverns, developed as a tourist attraction during the 1930s by Jack and Ida Mitchell, became a California state park during the mid-1950s. Today, the state of California administers the caverns and surrounding area as the Providence Mountains State Recreation Area.

### **LIST OF CLASSIFIED STRUCTURES**

The List of Classified Structures (LCS) is a park’s computerized, evaluated inventory of all historic and prehistoric structures having historical, architectural, or engineering significance in which the NPS has or plans to acquire any legal interest. Seventy-two structures are listed in the Preserve’s LCS. The structures listed include:

- Government Hole
  - Dugout
  - Windmill
  - Concrete Water Trough
  - Corrals
  - Water Tank
- Kelso Club and Restaurant
- Kelso Station
  - Coal Shed
  - Flagpole
  - Brick Walkways
- Marl Springs
  - Arrastra
  - Dugout
  - Dugout
  - Rock Walls
  - Rock Shelter
  - North Dugouts
  - Corrals
  - Water Trough
- Mojave Road
- Fort Piute
  - Main Building
  - Stone Corral
  - Corral Ruin
  - Secondary Ruin
- Zzyzx Mineral Springs Plaque
- Fort Piute Plaque
- Mojave Road Plaque
- Rock Springs Historical Marker

Marl Springs Plaque  
Rock Springs  
    Dugout  
    Stone Foundation  
    Diversion Dam/Cistern  
    Stone Wall  
Rock House  
Point of Rocks Water Trough  
Soda Springs Soda Works  
Russelite Camp Concrete Foundations  
Zzyzx Mineral Springs  
    Main Building  
    Castle  
    Zzycot Dormitory  
    Lakefront Dormitory  
    Cabana 1  
    Cabana 2  
    Pool  
    Poolhouse  
    Sunrise Building  
    Basketball Court  
    Diesel Plant  
    Concrete Tent Pads  
    Loading Dock and Cement Mixer  
    Gravel Separator  
    Dog Kennel  
    Fuel Tank Supports and Ladder  
    Nursery Irrigation System  
    Power Poles  
    Goat Shed  
    Goat Feeding Structures  
    Rabbitry  
    Stone Benches  
    Concrete Block Foundation  
    Goat Corral  
    Pet Cemetery  
    Electric Cross  
    Stone Altar  
    Trail to Electric Cross  
    Reservoir  
    Lake Tuendae  
    Lake Tuendae Platform  
    Lake Tuendae Fountain  
    Lake Tuendae Dock  
    Boulevard of Dreams  
    Subdivision Boundary Markers  
    Zzyport

### **NATIONAL REGISTER OF HISTORIC PLACES**

Three prehistoric archeological sites or districts located in or near the Preserve are listed on the National Register of Historic Places:

Piute Pass Archeological District – August 14, 1973  
Aiken's Wash National Register District (Baker Vicinity) – May 24, 1982  
Aiken's Wash Archeological Site "J" (Baker Vicinity) – May 24, 1982

Eleven archeological sites in or near the Preserve were determined eligible for listing on the National Register on May 24, 1982:

Archeological Site, CA SBR 2759 (also known as Aiken Willows Cave)  
Archeological Site, CA SBR 2760 (also known as Aiken Willows Petros I)  
Archeological Site, CA SBR 2761 (also known as Aiken Willows Petros II)  
Archeological Site, CA SBR 2762 (also known as Aiken Willows Petros III)  
Archeological Site, CA SBR 2817 (also known as Aiken Willows Petros IV)  
Archeological Site, CA SBR 2842 (also known as Aiken Willows Petros V)  
Archeological Site, CA SBR 2843 (also known as Aiken Willows Petros VI)  
Archeological Site, CA SBR 2844 (also known as Aiekn Willows Petros VII)  
Archeological Site, CA SBR 2763/H (also known as Aiken Tanks Petros)  
Archeological Site, CA SBR 3150 (also known as Aiken Wash Alignment)  
Archeological Site, CA SBR 7011 (also known as Aiken Cinder Mine Petros)

The historic Boulder Transmission Lines 1, 2, and 3 Archeological District (CA-SBR-7694H), located both in the Preserve and on adjacent BLM lands, was determined eligible for listing on the National Register as an archeological (historic) district on February 16, 1994.

A National Register nomination form has been prepared for the Kelso Club House and Restaurant Historic District.

National Register nomination forms is also being prepared for the Soda Springs Historic District and the Mojave Road.

### **CULTURAL LANDSCAPES**

Many cultural landscapes exist in the Mojave National Preserve that are potentially eligible for listing on the National Register of Historic Places, but cultural landscape studies have not been completed to identify their character-defining elements. A Cultural Landscape Inventory of the Kelso Club House and Restaurant Historic District will be completed in FY 2000, and a Cultural Landscape Inventory of the Soda Springs Historic District will be commenced in 2000. Landscapes reflecting significant mining, ranching, railroading, and ethnographic activities can be seen throughout the Preserve.

The Level 0 inventory completed for the Preserve contains:

Zzyzx Mineral Springs Historic District (Draft Nomination) (Landscape)  
Kelso Depot Historic District (Draft Nomination) (Landscape)  
Mojave Road (Landscape)

Potentially Significant:

Marl Springs

Rock Spring  
Paiute Pass (feature)  
Barker Dam (Listed '76)  
Paiute Pass Archeological District (Listed 8/14/73) (Landscape)  
Aiken's Wash National Register District (Listed 5/24/82) (Landscape)  
New York Hills Historic District (1890's) (Landscape)  
Death Valley Mine (Landscape)  
Vanderbilt Site (Component)  
Providence Mountains Historic District (Landscape)  
Foshay Pass (Feature)  
Macedonia Mining District (Landscape)  
Rock Springs/Government Holes (Component)  
Ivanpah Historic District (Landscape)  
Ivanpah (Component)  
Clark Mountain Mining District (Landscape)  
General Patton's Desert Training Center (Camp Essex) (Landscape)  
Lanfair Valley (Landscape with multiple owners)

The following historic landscapes are not managed by the NPS:

Union Pacific Los Angeles to Salt Lake City Line (Landscape)  
Boulder Transmission Line (Landscape)  
Mitchell Caverns (Landscape)

### **NATIVE AMERICAN RESOURCES**

For millennia, American Indian peoples have lived within the region of the present Preserve, using the resources and lands to sustain their lives and cultures. These lands have been and continue to be subject to active, often dramatic, and ever-changing natural forces that can alter water supplies, change vegetation zones, make new landforms from tectonic or volcanic events, and include cutting or filling geological processes. Climatic changes that have occurred since the end of the Ice Age have altered moisture in lakes and marshes, affected animal populations and plant life, and challenged humans to adapt. This area is characterized by a series of parallel, northward-draining trough-like valleys between north-south oriented mountain systems that form rain shadows, resulting in more evaporation than precipitation and general aridity. The basic necessities for human life of American Indian peoples are present – water and food, materials for tools, access to routes for traveling, special places for spiritual rites that continue today, as well as a sense of land association and place identity. These peoples' presence has resulted in a tangible heritage of cultural materials, remembered place names and associations, and attachments to the land from history to modern times.

Nonnative people describe lands as typical of the Great Basin geomorphological zone and of the Sonoran–Mojave Deserts in biological terms. From valley floors to mountain peaks, a series of environmental zones is described from lower elevation scrub plant communities, through Joshua Tree and pinyon-juniper woodlands, to higher elevations of mixed pine and pinyon woodlands. The valleys often contain dry lakes or playas. Transitional foothill zones are cut by drainage systems, forming seeps, springs, and active seasonal streams. To American Indian peoples now known as Mojave, Shoshone, Paiute, Serrano, Chemehuevi, and Kawaiisu, the lands were occupied and used in many ways, with flexible boundaries among these tribal groups. These peoples are differentiated by language, varied subsistence patterns, and self-identification. Specific historic geographical associations to northern and eastern Mojave Desert lands and places are known from compilations of information used in Federal Indian Land Claims court cases during the 1950s and 1960s.

In general, tribal peoples historically occupied their lands in small, mobile social units of related families who traveled in regular patterns, establishing summer or winter camps in customary places with water supplies, often located at a border between scrub or woodland zones. Some localities contained richer and more dependable food resources than others, but the lands did not support large numbers of persons at any one location. Many plants yielded seed, nut, tuber, or fiber foods, prepared for consumption or for storage at convenient caches. Large or small land mammals were hunted or caught, birds such as doves or quail were snared, and reptiles were collected, but not all plants or fauna were sought. The diet for these native peoples was largely vegetarian, supplemented by mammals, reptiles, and insect sources. Certain places on the lands were and are today considered specially significant; for example, landforms named in oral accounts of travels by supernatural beings, “hot” springs that have curative purposes, petroglyph sites believed to be the products of the shamans’ supernatural helpers, or topographic landmarks identified in complex chants known today as “bird songs.” In essence, “oral maps” of northern and eastern Mojave Desert lands still exist today in ceremonial knowledge held by certain Mohave and Chemehuevi individuals. Other tribal members have documented descriptive names in Shoshone language for places of settlement, gathering camps, and other important locations in the Preserve area.

During the past two centuries American Indian peoples inhabiting the northern and eastern Mojave Desert area have changed their territorial ranges in reaction to European and later American direct and indirect pressures, as well as intertribal struggles. U.S. military presence increased at Camp Cady, east of Mojave National Preserve, at established posts in Owens Valley, and at Fort Mohave along the Colorado River in response to increasing American settlement and mining and ranching operations. These pressures resulted in establishment of more concentrated reservations and communities by the early 20<sup>th</sup> century.

Earlier movements were caused by groups of families moving toward growing towns, thus shifting populations from more traditional scattered patterns. For example, from the southern Nevada portion of Southern Paiute-held areas, people now known as Chemehuevi had moved toward the Colorado River valley early in the 19<sup>th</sup> century. Kawaiisu, Koso (also known as Panamint Shoshone), and Serrano peoples were jointly using terrain around the Granite and Providence Mountain ranges during the 19<sup>th</sup> century.

During the 1950s and 1960s, Federal Indian Lands Claims court cases involving Chemehuevi, Mohave, and Owens Valley Paiute tribes included documented occupation and use of many mountain ranges, valleys, and resources in the Mojave Desert region. Maps illustrating Chemehuevi use of the lands now in Mojave National Preserve were accepted by Mohave tribal officials as well. Individual members of the Mohave Tribe have family historical information on early 20<sup>th</sup> century land uses in or near Preserve lands. Today’s tribal governments and communities historically associated with the region in which the Preserve is located include:

The Chemehuevi Indian Tribe Reservation (30,600 acres) was established by presidential executive order in 1971. Federal recognition was received in 1970. Economic support derives from land leases, retail businesses, tourism and recreation services, and gaming. Tribal enrollment is about 500 persons, 300 of whom reside on or near the Havasu Lake, California, developed area.

Mohave Indian Tribe Reservation lands lie in Arizona, California, and Nevada, but tribal offices and some residential areas are in Needles, California. In 1864 a reservation was established from a former military fort reserve and nearby traditional lands. Economic developments relating to gaming, tourism, recreation, and retail business with considerable

agricultural land leases provide tribal and individual incomes. The tribe population numbers approximately 1,000, with some 500 people living on or near reservation lands.

The Las Vegas Piute Tribe is composed of “Nuwuvi” people, called Paiute by others, who have inhabited present-day southern Nevada from pre-European time to the present. In 1911 a small parcel of trust land was established near the town of Las Vegas. Today, the tribe owns the original 16-acre area and a 3,800-acre area north of metropolitan Las Vegas. The tribe numbers about 100 people who obtain their economic support from tribal tourism enterprises, retail sales, and wage work.

Located in San Bernardino County, California, the San Manuel Tribal Community is composed of historic Serrano peoples who occupied the mountainous areas in present-day Riverside and San Bernardino counties, with their related neighbors, the various Cahuilla communities. The 660-acre reservation was established by Congress in 1893. The tribe consists of about 85 persons residing on or near trust lands. Tribal enterprises include a casino and a curation facility.

## **SOCIOECONOMICS**

Additional information on the socioeconomic environment is provided in a separate analysis entitled “Economic Impact Analysis: Northern and Eastern Mojave Planning Area” by Dean Runyan and Associates (1998).

The planning area covers three California counties. Roughly 40% of the Preserve is in San Bernardino, 59% in Inyo, and the rest is within Mono County. From a regional perspective there are relatively very few people living on private property within the planning area boundary, particularly when the large metropolitan cities of Los Angeles and Las Vegas are considered. Both of these large cities are within 150 miles of the planning area and make a large contribution to the pool of annual visitors. In a recent survey, 81% of all visitors to Mojave National Preserve were from California. About 35% drove 100–200 miles to arrive; 40% traveled between 210 and 500 miles. That would indicate that most visitors are from the Los Angeles or San Francisco areas. There is a great contrast between visitors to Death Valley and Mojave: only 32% of the total visitors to Death Valley are from California, and 69% are international visitors.

### **LOCAL AND REGIONAL COMMUNITIES**

The 1990 Census Indicated the Following Community Populations:

#### **Baker, California**

Baker’s estimated current population is 550. Most other unincorporated communities within the planning area have populations of fewer than 50 people. Searchlight and Laughlin, Nevada, and Bullhead City, Arizona, are outside the planning area.

#### **Needles, California**

The city of Needles is in the eastern Mojave Desert on the banks of the Colorado Desert, 140 miles east of Barstow. The 1996 population of Needles was 5,750.

Over 75% of the communities in the northern desert of San Bernardino County are unincorporated. Per capita income is estimated at \$12,000. Most of the population in Inyo County lives along California Highway 395, where many residents are employed in services, retail, mining, and agriculture. An

increasing amount of the economy is being driven by tourism. More than 98% of Inyo County land is governed by federal agencies. Because of limited private land, and large ownership of water rights by the Los Angeles Department of Water and Power, limited growth is expected. Most of San Bernardino County, which is in the planning area, is managed by federal agencies such as the Bureau of Land Management, National Park Service, and the military.

### **MOJAVE NATIONAL PRESERVE COMMUNITY**

Mojave National Preserve has a population of seasonal and permanent residents who live in many parts of the Preserve, such as Lanfair, Pinto, and Round Valleys. An estimated 200 full-time residents now live in the Preserve. Of those, 109 live in Round and Lanfair valleys. An estimated 136 people stay on their properties during weekends in the Round and Lanfair valleys. Private property comprises 5% of all private land within the Preserve. Most of the people living in the Preserve on a full-time basis are retired or self-employed. An estimated 20–25 full-time residents are employed in ranching, mining, at Union Pacific Railroad, or at Castle Mountain Mine.

### **SOCIAL VALUES**

During a meeting to gather information on social values the residents of the Preserve expressed varying attitudes about their informal community. Most people live to obtain a sense of independence from government and its regulatory controls and freedom from urban crime and pollution. The residents love the land and the opportunity to experience the four seasons. They are concerned about the potential impacts on their land from increased visitation. Many residents would prefer that the National Park Service leave them alone to live their lives unhindered by regulations, yet some have voiced a desire to have the presence of rangers to help patrol and protect the land and offer emergency assistance when needed. Despite the desire for independence, there is a strong sense of community among the residents. Several residents voiced the strong sense of support that neighbors offer to each other. Living a great distance from stores and other services that are common in cities creates the situation where neighbors rely on each other for materials and labor to fix broken water pipes, doors and other items. Social events were described where several neighbors gather to eat, drink, and talk. Close friendships appear to exist between many of these people. Overall, the desire for privacy and independence exist, as do the social ties that make up a close-knit neighborhood and are not commonly found in many urban settings.

## **FACILITIES AND DEVELOPMENT**

### **VISITOR INFORMATION**

#### **Information Centers and Sources**

The National Park Service currently leases commercial space under the giant thermometer adjacent to the Bun Boy Restaurant in Baker, California as a visitor information center. The Death Valley Natural History Association and Mojave National Preserve share support and material costs. Information is available about recreational activities in Death Valley National Park, Mojave National Preserve, and surrounding Bureau of Land Management recreation sites such as Dumont Dunes.

The Preserve leases office space in downtown Needles, California, for a visitor information center. This facility is jointly staffed by the National Park Service and the Bureau of Land Management and provides interpretive and recreational information about Mojave, Lake Mead and BLM lands.

The Preserve also operates a visitor contact center at Hole-in-the-Wall in a building constructed by the Bureau of Land Management. A small amphitheater and picnic area are also available. This visitor contact center serves as a point for people camping in or visiting the area and provides overnight, short-term housing for one NPS staff member. Hole-in-the-Wall is staffed seasonally as public demand exists and staffing levels allow for someone to work here. Electricity is provided by a solar electric system.

Information on park recreational opportunities has become increasingly available on the internet over the last several years. The National Park Service maintains sites on every park unit at the address: [www.nps.gov](http://www.nps.gov). By accessing this site, visitors can also gain access to numerous other links about NPS issues, policies and visitor data. This site will help visitors planning a trip to the area gain the basic information about activities, camping, and phone numbers. From the general nationwide homepage, the park has constructed much more detailed information on Mojave. For instance, detailed information on the geology of the Preserve has been assembled in a cooperative venture with the U.S. Geological Survey. In addition, the park cooperated in the development of an interagency desert-wide website that provides information on public lands in the desert and links to many interesting and informative sites. This page can be found at: [www.californiadesert.gov](http://www.californiadesert.gov).

## **INTERPRETIVE FACILITIES**

### **Kelso Depot**

The Kelso Depot offers considerable potential as the main interpretive and visitor contact facility for the Preserve. The building has two main floors above ground, and a basement space. Total square footage in the building is 11,500 sq. ft. Currently however, it is not accessible to the public and is interpreted only by a couple of information panels around the building. The building was abandoned by Union Pacific in 1985 and has been damaged over the ensuing years by vandalism, removal of asbestos, earthquakes shaking off plaster, and fifteen years of nonuse. Most of the historic furnishings were removed prior to NPS ownership. Modifications over the years have resulted in alteration of the historic fabric in some parts of the building, such as the addition of modern dry wall, new wall partitions and drop ceilings. Most of the historic landscaping has long since died or been removed, except for six large date palms. Parking is on denuded grounds to the west and north of the building. Bricks from the front of the building were removed by BLM and stored in a large steel container onsite. The site has easy access to electrical power, but telephone lines are limited at this time. Water and sewer are no longer available and must be developed if the building is to serve the public as a visitor center. Portable toilets were installed by the NPS in 1995 due to the high use in the area.

The depot is within a 100-year floodplain. The National Park Service conducted a floodplain study in 1997 to determine the potential threat of flooding to the building. Mitigating measures such as armoring the dike north of the depot, elevating a portion of Kelbaker Road so as to fill in the gap in the dike that the road creates, or establishing an advanced warning system could reasonably address concerns for the protection of human life and government property.

### **Soda Springs (Zzyzx )**

The visitor shade structure, restroom and parking lot have been reconstructed or replaced to remove structurally unsafe and nonfunctional facilities. A self-guided trail and some interpretive panels provide some basic information on some aspects of the history and current use. A few interpretive panels and a self-guided trail currently provide limited visitor information.

### **Hole-in-the-Wall**

Existing interpretive facilities are limited to basic information and displays in the existing visitor information center. Maps and book sales are also available. Seasonal staff or volunteers open the building during the spring, summer and fall. A couple of existing interpretive panels are also in place at the top of the Rings Trail.

### **Signing and Orientation**

Existing signs in the Preserve can be categorized as directional, regulatory and informational. The county along the main travel routes posts most of the regulatory signs (i.e. speed limits). Directional signs, providing mileages and directions to specific sites, have been posted by the county, the National Park Service and the state. The park has recently erected major entrance monuments at each of the six paved entrances, marking the entrances into the Preserve, and including an information panel with a map and general information. Caltrans has also recently erected Mojave National Preserve signs along I-15 and I-40 at each of the entrances. Informational signs mark points of interest and visitor facilities or may provide interpretive information about a particular resource. Many such signs existed when the Park Service began administering the area in 1994. Most of the signs marking the visitor facilities have been replaced with standard NPS signs, reflecting the new Mojave National Preserve designation. None of the interpretive signs have yet been replaced.

### **Wayside Exhibits**

Previous BLM installed interpretive panels exist at Kelso Dunes, Zzyzx, Hole-in-the-Wall, Ft. Piute, Rock Springs, Cow Cove and the Teutonia Peak trailhead. The National Park Service has also installed an interpretive panel at the Kelso Depot.

### **DEVELOPED CAMPGROUNDS**

Mojave National Preserve has two developed campgrounds, Hole-in-the-Wall and Mid Hills. There is no fee to enter Mojave National Preserve, but a fee is charged at Hole-in-the-Wall and Mid Hills campgrounds for the use of an individual or group campground.

Hole-in-the-Wall contains 35 campsites, water, vault toilets, an RV dump station and a campground host site. It is in very good condition. All campsites are accessible to visitors with disabilities and are designed for access by large recreational vehicles. The water system has recently been refurbished to provide better service. There is also a group camping facility with a corral at Hole-in-the-Wall.

The Mid Hills campground contains 26 campsites. It was not designed for larger vehicles, but serves tent campers and those with small recreational vehicles. The Mid Hills water system has been completely replaced and new vault toilets were installed in late 1997. Picnic tables and fire grates have also been upgraded.

California State Parks also operates a small, six-site campground at Mitchell Caverns.

### **RESEARCH AND EDUCATION CENTERS**

#### **Soda Springs Desert Study Center**

Soda Springs Desert Study Center is located a few miles south of I-15 off the Zzyzx exit, which is approximately 8 miles south of Baker. It is home to the Desert Studies Consortium, a part of the California State University system. The facility, operated under an agreement with the National Park Service, offers dormitory-like lodging and classroom space for researchers and students attending field classes and extended education courses. Solar, diesel, and wind power provide electricity to the

buildings. The facility consists of a complex of historic and modern buildings all located on National Park Service property. The historic buildings and site features have been nominated for the National Register of Historic Places as a historic district. There are 12 buildings, 3 sites, and 11 structures that have been identified as contributing elements to the historic setting. A total of 12 buildings/structures that have not been identified as contributing to the historic setting.

All the buildings (except mobile ones brought in by California State University) are federal property. The consortium has repaired and maintained most of the buildings and site features over the years to keep them in good condition. The site, structures, and buildings are to be managed through a cooperative agreement being developed between the consortium and the National Park Service. A caretaker associated with the consortium lives at the facility.

An unstaffed visitor information shade structure with restrooms and parking is located at the entrance to the education center. A path with interpretive signs leads visitors from the shade structure and around the pond directly to the east.

A fence and gate south of the facility keeps most trespass vehicles from the adjacent BLM Raptor off highway vehicle open area out of the facilities, but on occasion vehicles illegally bypass the fence and come across the dry lakebed, which has been designated as wilderness.

### **Granite Mountains Natural Reserve**

The Granite Mountains Natural Reserve is part of the University of California natural reserve system and is dedicated to ecological research and education. The reserve serves as a classroom, laboratory, and ecosystem library for field studies in natural sciences. Every year, field classes and researchers come to the reserve. With the passage of the California Desert Protection Act, Congress designated 9,000 acres of the Mojave National Preserve as the Granite Mountains Natural Reserve. Within the 9,000 acres, approximately 2,200 acres are owned by the University of California. Housing, classroom facilities, a library, and office space is constructed and maintained by University of California, Riverside (UCR) on state land. No facilities are located on NPS land. UCR has sole authority for the use and maintenance of their facilities. The NPS and UCR have signed a cooperative agreement for the management and visitor use of the reserve.

## **PARK SUPPORT FACILITIES**

### **Headquarters**

The headquarters for Mojave National Preserve currently occupies leased office space in the Mercado Mall (222 East Main St.) in Barstow, California. Other suites are available for leasing, but secured parking for government vehicle storage and warehouse space is unavailable at this site. In 2000, Mojave initiated steps through the General Services Administration to have new office space built to suit the needs of the headquarters operation. Attempts are being made to co-locate with the U.S. Fish and Wildlife Service and the Mojave Desert Ecosystem Program staff. Commercial support services and housing are readily available in Barstow, Victorville, and surrounding communities.

### **Field Offices**

The information center at Hole-in-the-Wall is also used as a field office for NPS staff. A visitor information center in Needles is in a leased building and also serves as office space for ranger staff. A small building was constructed in Baker in early 1998 for use as an office for interpretive, visitor protection, and maintenance staff. A mobile home in Kelso is used as a residence/office for a visitor protection ranger.

### **Maintenance Facilities**

An office building was constructed in early 1998 in the abandoned Caltrans yard in Baker. Maintenance and visitor protection staff currently have offices in this building. The yard has several small structures that are used for storage and covered parking. A small carpenter shop was constructed in one of the empty buildings. The maintenance yard has plenty of open space to be used for vehicle and material storage. Some maintenance work is also based out of the Hole-in-the-Wall fire center, where there are a few small storage buildings.

### **Interagency Fire Center**

A wildland fire control operation at Hole-in-the-Wall includes a dormitory, office space, a vehicle storage building, and other storage buildings. Electricity is provided by a diesel generator. The Hole-in-the-Wall fire center dormitory, which is in fair to poor condition, houses 12 employees. Current staffing plans call for 15 employees in 1998 and up to 20 employees in the future, which means the dormitory is inadequate. Staff offices are also located in this building. The National Park Service added aboveground storage tanks for gasoline and diesel fuel. A dirt helicopter pad located just outside the fire center compound does not meet current agency standards. When used in the past, the access road to the group camping and equestrian areas was blocked.

### **Employee Housing**

NPS employees find housing in many different ways. At headquarters in Barstow, employees obtain housing in the local communities. Employees in Baker may have the option of living in one of the five doublewide trailers once owned by the California Department of Transportation (Caltrans) or renting space in the community. Rentals are limited in Baker. The trailers, which are in an old Caltrans maintenance yard on BLM-managed federal land at the north end of town, are in fair to good condition. The NPS has upgraded them for occupation.

Kelso has a number of doublewide trailers that the railroad uses to house employees. Not all of the trailers have been occupied, and the National Park Service was able to rent one of them for employee housing. The stability of this housing option is uncertain. The National Park Service also owns a home northeast of the Hole-in-the-Wall ranger station off Black Canyon Road. The home is in poor condition and needs major rehabilitation before it could be occupied. The visitor contact center at Hole-in-the-Wall provides a small efficiency apartment for one person.

Existing housing in the community of Needles meets employee needs.

### **ACCESS AND CIRCULATION**

The Northern and Eastern Mojave planning area contains several highways that serve as major transportation corridors through the state. Interstates 40 and 15 function as major routes between Los Angeles and southern California and many states to the east. A sampling of I-40 traffic during 1995 indicated that trucks accounted for 19–31% of overall traffic and recreational vehicles, 4–6%. The rest were passenger vehicles. Interstate 15 also receives a heavy amount of truck traffic, but its percentage of overall traffic is not known. I-15 carries the highest daily traffic volumes of any highway in the planning area. I-15 traffic increases on weekends as residents of Los Angeles travel to Las Vegas and then return. Traffic accidents, snow on high passes, and other incidents can close sections of I-15, forcing traffic to be routed through Mojave National Preserve and back onto I-15. The rerouting of traffic through the Preserve has resulted in additional accidents and other impacts, according to San Bernardino County officials.

Kelso Depot is located at the Preserve's most used crossroad, where the 1997 average was 172 cars per day. Weekend traffic levels are estimated as being much higher but exact figures are not available. Train traffic on the Union Pacific tracks is also very active, causing frequent delays on the Kelbaker Road of 15 to 30 minutes and sometimes up to 1 hour. This is because the road crossing is in the middle of the railroad siding. Trains must be separated into two parts at the road when they stop, necessitating a lengthy process to set individual brakes on each car. The trains are an attraction to visitors, but they also pose a threat to their safety.

Old Route 66 (National Trails Highway) runs through the south end of the planning area between Needles and Ludlow. The road is maintained by the county of San Bernardino. An increasing number of travelers have been attracted to this road because of the American culture and nostalgia attached to this highway. Movies such as *Bagdad Cafe* and other media have raised awareness to the point where even international visitors are driving the highway. Many cities and businesses along the highway are promoting Route 66 for the potential revenues from tourism. The highway has been nominated for the National Register of Historic Places (see "Transportation" in the "Cultural Resources" section for more information).

Traffic has increased on local paved and maintained roads over the past years. The roads carry travelers north of Palm Springs, through Mojave National Preserve, onto I-15, then back again. It is assumed that most of these travelers are headed to Las Vegas for the weekend.

The following table shows traffic figures as recorded by the California Department of Transportation for 1995. Figures reflect the combined number of vehicles traveling in both directions.

**TABLE 12: 1995 AVERAGE DAILY TRAFFIC LEVELS**

State Highway	Peak Hour*	Peak Month	Annual Average
I-15, Cima Road interchange	4,200	32,000	29,000
I-40, Kelbaker road interchange	1,200	12,400	11,000

\*Peak hour is the hour during which the heaviest volume of traffic occurs on a roadway.

## **Roads**

### **Paved Roads**

Mojave National Preserve has six main paved entry ways: Kelbaker Road, Cima Road, and Ivanpah Road off of I-15 on the north side; Kelbaker Road and Essex Road off I-40, and Goffs/Lanfair Road off of Route 66 on the south side. All these roads generally lead visitors in a north-south orientation with Kelso as a common point for four of these roads. The roads are all suitable for standard sedans and are in fair to good condition. Among these roads, Kelbaker road from I-40 to Kelso, Kelso-Cima Road and Morning Star Mine Road receives the heaviest use. Most traffic occurs on weekends as many drivers use these roads to travel to and from Las Vegas and Palm Springs.

The National Park Service does not maintain any paved roads at this time. San Bernardino County maintains an estimated 255 miles of road in the Preserve of which 176 miles is paved.

**TABLE 13: JULY–DECEMBER 1996 TRAFFIC COUNT**

<b>Highway</b>	<b>Average Daily Traffic</b>
Kelbaker Road, southbound off I-15	45
Cima Road, southbound off I-15	55
Ivanpah Road, southbound off Nipton Road	144
Kelbaker Road, northbound off I-40	167
Essex Road, northbound off I-40	20
Ivanpah Road, northbound off Goffs Road	18

Note: numbers represent incoming vehicles only.

A road inventory by the county in 1996 indicated that there are approximately 2,180 miles of roads within the Preserve (see back pocket map). Approximately 345 miles of roads were closed to mechanized and motorized use by Congressional designation of wilderness in the 1994 California Desert Protection Act. Roads were created over many years for access to utility corridors, ranching improvements, private property, mines, homesteading, favorite hunting or camping areas, viewpoints and for a variety of other reasons.

#### **Maintained Dirt Roads**

The National Park Service maintains approximately 20 miles of dirt roads, including the Wildhorse Canyon, Kelso Dunes (first three miles), and the Zzyzx access road. The county maintains the unpaved Black Canyon Road, Lanfair Valley Road and Cedar Canyon Road (approximately 79 miles), which are normally suitable for use by passenger cars, except for occasional flood damage.

#### **Backcountry Dirt Roads**

The Preserve also has hundreds of miles of unmaintained dirt roads that traverse the backcountry. The condition of these roads varies considerably, from sometimes being passable by a passenger car, to barely suitable for a four-wheel drive vehicle. No regular maintenance is conducted by the National Park Service or San Bernardino County on these roads, although emergency repairs may be conducted.

#### **Mojave Road**

The Mojave Road is a historic route that traverses the Preserve for about 60 miles from Ft. Piute to Zzyzx. The road was used from 1857–1883, abandoned, and not regularly used again until the early 1970s. A series of guidebooks authored by Dennis Casebier provide directions and interpretation of the cultural and natural history along the route. See the cultural resource section for a description of the road history. The existing alignment follows the historic road in some sections, while in others it parallels the old road section on a newer road. The section from old Ft. Piute through the canyon to the top of the ridge has not been used by vehicles in many years and retains much of its historic character. Most of the route is suitable only for high clearance or four-wheel drive vehicles. Maintenance over the years has been performed by user groups, such as the Friends of the Mojave Road.

#### **Sand and Gravel for Road Maintenance**

There are no existing sites in the Preserve that are currently used for obtaining sand and gravel for road maintenance. Some previously used sites do exist and need to be evaluated for reclamation potential.

#### **Trails**

Few surface water sources in the Preserve are suitable to support extensive backpacking, but there are many opportunities for day hiking. There are two developed trails, one between the Mid Hills and

Hole-in-the-Wall campgrounds, which is 8 miles one way. The second trail leads to Teutonia Peak from Cima Road and is 2 miles one way. Piute Canyon trail is an undeveloped trail, although an evident footpath established by use exists partway up the canyon. Cross-country hiking is also a traditional way of using the desert. Existing roads that are now included within wilderness areas are closed to use by mechanized vehicles, but open for hiking and equestrian use, including use by wheelchairs in accordance with NPS policy. All nonwilderness roads are open to hiking, bicycles, horses and licensed motorized vehicles.

A recreational driving trail also traverses the Preserve in several locations. The Heritage Trail is a collection of 660 miles of existing roads (mostly outside the Preserve) for which a series of guidebooks has been published to provide a recreational driving experience in the backcountry of the desert. This trail is still open for those visitors who prefer a driving experience in the backcountry, although some segments were affected by wilderness designation.

### **RIGHTS-OF-WAY AND EASEMENTS**

There are approximately 125 rights-of-way and/or easements within the Preserve. Some of these are entirely within the boundary, while others enter the Preserve and may terminate within or pass through the Preserve. Some of the existing rights-of-way and/or easements are listed below.

<b>Right-of-Way/Easement</b>	<b>Purpose</b>
AT&T	Underground communications cable
Southern California Edison*	Electric transmission line, aerial
Southern California Gas Co.*	Natural Gas pipeline
Cal-Nev	Oil pipeline
Molycorp*	Waste water pipeline
Pacific Bell	Communication site
U.S. Sprint	Telephone line
Union Pacific	Railroad
	Water pipeline
	Communication site and road
Kaiser Resources	Tram road
Southern California Gas Co.	Petroleum pumping station
Cal Trans	Material site (gravel pit)
U.S. Geological Survey	Seismic station

*\*Congress provided specific direction in section 511 of the California Desert Protection Act on these rights-of-way/easements.*

### **RAILROADS**

The Union Pacific (UP) railroad line traverses the center of the Preserve for 91 miles, from Nipton, through Cima and Kelso, and to the southern edge of Soda Lake. This railroad right-of-way (ROW) is a 200-foot wide corridor that was granted by Congress in 1875. The railroad operates as a major regional freight corridor to southern California, servicing as many as 30 freight trains per day. UP also owns land in the Kelso Depot area and houses a small crew there in several mobile homes.

Passenger train service through the Preserve was discontinued by Amtrak in 1997. UP is currently pursuing permits to construct a second set of tracks parallel to the existing set, extending from Kelso Depot to Cima. This project would allow the return of passenger service from Los Angeles to Las

Vegas, provided by Amtrak. Review of this double-tracking proposed is occurring under separate compliance.

Burlington Northern and Santa Fe railroad also operates a major railroad line that parallels the southern boundary of the Preserve in some locations. East of Goffs the railroad right-of-way forms the Preserve boundary, with the tracks being outside the Preserve. This railroad does not enter the Preserve, but operations adjacent to the Preserve may impact park resources.

## **Roads**

Most of the roads in the Preserve were constructed without rights-of-ways or easements being granted. However, their existence and use over many years may have established a “prescriptive easement.” The county of San Bernardino contends that all established roads in the Preserve are valid RS 2477 rights-of-ways. Revised Statute 2477 concerns rights-of-way established across public lands under the Mining Act of 1866. Although repealed by Congress in 1976 with enactment of the Federal Land Policy and Management Act, routes that existed prior to October 21, 1976 may “qualify” as an RS-2477 right-of-way. However, a right-of-way asserted under RS-2477 is not automatically assumed to be valid. Regardless of whether a party can successfully assert a valid claim to a right-of-way across national park land, the NPS retains the authority to regulate use of an RS-2477 right-of-way. *See U.S. v. Vogler*, 859 F.2d 638, 642 (9<sup>th</sup> Cir. 1988).

## **WILDLIFE GUZZLERS**

Approximately 130 small game and six big game guzzlers were installed throughout the Preserve by agencies and interest groups over the last 60 years. The guzzlers were developed by the California Department of Fish and Game, the Bureau of Land Management, and volunteers before the area was designated a Preserve in 1994.

A guzzler is a permanent self-filling water catchment. Most are similar to a cistern and are simple, low-maintenance devices that are essentially tanks filled by rain-collecting aprons (Giles 1971). Guzzlers are installed and used to provide water for hunted species in arid areas. Nongame species such as reptiles, songbirds, and insects also use these manufactured devices. Birds enter the covered tank through an opening and walk down a ramp to the water. For bighorn sheep, piping extends from the storage tank to a drinking trough, which has a float valve to regulate the flow.

Game numbers have been increased greatly in parts of the arid West by the use of guzzlers (developed by Ben Glading, California Department of Fish and Game) (Dasmann 1964). Professor Dasmann warned that while the guzzler is functioning, animal numbers should be limited to the area’s carrying capacity as “excess numbers of game can easily damage food and cover in areas near water, and in arid lands this damage is long lasting” (Dasmann 1964). This type of damage has been observed in the Mojave Desert near big game guzzlers but not in guzzlers designed for game bird use (McGill, pers. comm.).

A disadvantage of guzzlers is that dead tortoises are sometimes found in them and the believed cause of death is drowning (Frank Hoover, pers. comm., 1995). In an examination of guzzlers on BLM lands, one in four were found to contain large dead mammals, and one in five were found to contain dead tortoises (McGill, in preparation). McGill further observed that all guzzlers with dead animals in them were constructed of fiberglass. McGill has not observed any animal carcasses in concrete guzzlers. The U.S. Fish and Wildlife Service recommends that “If guzzlers are constructed, they should include fencing or other means to exclude tortoises” and that existing guzzlers should be retrofitted with exclusion devices (FWS 1996). McGill recommends that fiberglass guzzlers be fitted with escape ramps, as he has observed no mortality in these types of guzzlers.

## **RANCHING DEVELOPMENTS**

Developments associated with ranching operations have been installed throughout the Preserve over the last 100 or more years. Hundreds of miles of barbed wire fences and water pipelines, as well as dozens of cattle guards, windmills, water tanks, troughs, corrals, earthen reservoirs, houses, barns, sheds and other structures exist to support the ranching operations. Maintenance of most of these facilities is the responsibility of the rancher who benefits from their use. Some fences, water tanks, pipelines and windmills are the responsibility of the NPS, the county or Caltrans (along I-15 and I-40) and are maintained by those entities. A partial inventory of these developments exists, but additional work remains to ensure the completeness and accuracy of the mapping and database.

## USE OF THE PRESERVE

### RECREATIONAL ACTIVITIES

Mojave National Preserve has long provided recreational opportunities for people from all over the world. Its nearness to major population centers such as Los Angeles and Las Vegas, combined with major interstate highways, gives residents the opportunity for relatively easy access to many parts of the desert. Most of the landscape is open, with broad vistas of relatively undeveloped land. The vastness of the landscape offers visitors an opportunity for seclusion and a sense of wilderness, even while in a vehicle. Early miners and ranchers developed roads that today offer visitors a chance to drive into many remote locations where informal camping has traditionally occurred. There are several major sand dune systems. Hikers play on and explore the Kelso Dunes. There are many cultural sites such as abandoned mining districts, which many people love to visit. The mountain ranges, such as the New York and Providence Mountains, offer a contrast to the dry hot valleys, attracting many people in summer with cooler temperatures and forested areas. Volcanic cinder cones, lava flows, rock outcrops, and unique wildlife and vegetation are other elements that attract people. The land has many extremes and contrasts that people come to experience, such as the high summer temperatures. Most visitors come to the desert simply to see the outstanding scenery of this diverse landscape.

**TABLE 14: ANNUAL VISITATION FOR MOJAVE NATIONAL PRESERVE**

<b>1985</b>	<b>1993</b>	<b>*May 1996 – Apr 1997</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>
60,000 (est.)	250,000 (est.)	339,700	378,977	374,378	391,694

\* Mojave NP traffic counters at six paved entrances began operating in May 1996.

Most visitation to the Preserve occurs between October and May. It is estimated that 72% of overnight visitation occurs at this time. In July 1996, 12,842 vehicles entered the Preserve, compared to 14,617 in March 1997. While the numbers are very close, relatively few people stay more than a few hours in the summer. Campground use statistics show a different picture of summer visitation. During July 1996 there were 35-user days, and during March 1997, there were 1,412. These numbers reflect use of all developed campgrounds. Campground use has increased over the years; the Bureau of Land Management recorded 960 user-days during April 1991; while the National Park Service recorded 1,252 in 1996 and 1,500 in 1997. These numbers may reflect having campground hosts and different BLM and NPS collection processes.

The 1997 visitor study revealed that 64% of the visitors were from California and 11% were from Nevada. Most people started from Las Vegas, Nevada or from Twentynine Palms or Barstow, California on the day of their visit to the Preserve. There may also be a large number of visitors who are taking a scenic route between Joshua Tree National Park and Death Valley. The most concentrated use periods are the first two or three weekends of the upland bird and deer seasons in October and November, and the Thanksgiving and Easter weekends. April had the highest visitation record of any month during 1996.

Many residents of adjacent communities such as Needles, Laughlin and Bullhead City come to the higher elevations in the Preserve during the summer to escape the heat and enjoy a change of scenery. Most visitation to the Preserve occurs on weekends when residents of California, Arizona and Nevada arrive. Daytime recreational use is expected to continue to increase as the populations of Clark County and Laughlin, Nevada, Bullhead City and Kingman, Arizona, Barstow and Needles, California continue to grow.

Traffic counters and field observations indicate that many people are using roads in the Preserve as a route between Las Vegas and Twentynine Palms. Most use in the Preserve is sightseeing and driving for recreation, but the diverse landscape offers many other forms of recreation including activities such as hunting, nature study, rock-climbing, mountain biking, exploring by 4WD vehicle, and hiking.

The Bureau of Land Management contracted for a visitor survey of the East Mojave Scenic Area (now the Mojave National Preserve). The report of the survey, completed in 1990, indicates that visitors participated in the following activities:

**TABLE 15: BLM VISITOR ACTIVITIES IN EAST MOJAVE (PRE-CDPA)**

<b>Visitor Activities (1990 – BLM Visitor Survey)</b>	<b>Participation Levels</b>
Auto-touring/sightseeing	43%
Nature study/hiking	19%
Off-road vehicle use	14%
Camping in developed campgrounds	14%
Dispersed camping	10%
Hunting*	Not available

\* Hunting was not included in the initial survey but is a significant visitor activity during fall upland bird and deer hunts.

**TABLE 16: BLM VISITOR PROFILE FOR EAST MOJAVE NATIONAL SCENIC AREA**

<b>Visitor Profile (1990 BLM Visitor Survey)</b>	<b>Percentage/Age</b>
First-time visitors	43%
Repeat visitors	57%
Traveled 100–200 miles to get to the Preserve	35%
Traveled 210–500 miles to get to the Preserve	40%
Came to view the scenery	72%
Average age	25- 40 years
California residents	81.5%
Stayed 13–24 hours during visit	17.5%
Stayed 3–7 days during visit	25.5%
Stayed 1–2 days during visit	44%
Said the Preserve was not their primary destination	11.2%
Said the Preserve was their primary destination	84.1%

**TABLE 17: MOJAVE NATIONAL PRESERVE VISITOR PROFILE**

<b>Visitor Profile (1997 NPS Visitor Study)</b>	<b>Percentage/Age</b>
First time visitors	46%
Repeat visitors	54%
International visitors	7%
Visitors from California	69%
Visitors from Nevada	12%
Average age	36-55 years
Stayed less than 1 day	61%
Stayed 3–4 days	29%
Stayed 7 or more days	4%
Of those who stayed less than a day, (stayed only 1 hour)	10%
Of those who stayed less than a day, (stayed 2–4 hours)	52%
Visited Kelso Depot	66%
Visited Kelso Dunes	57%
Visited Hole-in-the-Wall campground	35%
Visited Mid Hills campground	25%
Visited Mitchell Caverns	22%
Traveled on Wildhorse Canyon road	19%
Traveled on Mojave Road	16%
Visited Caruthers Canyon	8%
Visited Zzyzx	4%

**TABLE 18: MOJAVE NATIONAL PRESERVE VISITOR ACTIVITIES**

<b>Visitor Activities (1997 NPS Visitor Study)</b>	<b>Participation levels</b>
Auto-touring/sightseeing	61%
Nature study/hiking	49%
Offroad vehicle use	51%
Camping in developed campgrounds	22%
Day hike	41%
Visit ruins/historic sites	32%
Driving through only	28%
Dispersed camping	15%
Hunting*	Not available

\*Hunting was not included in the initial survey but is a significant visitor activity during fall upland bird and deer hunts.

### **ROCK-CLIMBING**

There are potential or actual rock-climbing resources in the following areas: Clark Mountain, the Granite Mountains, the New York Mountains, Mid Hills, Teutonia Peak, and the Hole-in-the-Wall area. With the exception of Clark Mountain, these locations are lightly utilized for technical rock-climbing, and contain few fixed anchors (climbing bolts and other devices not removed after each climb). The climbing areas at Clark Mountain, Teutonia Peak and the New York Mountains are within designated wilderness. Climbing areas at Mid Hills and Granite Mountains are both within and outside wilderness, and potential climbing at Hole-in-the-Wall is outside wilderness.

Access to the climbing resources at the Granite Mountains, New York Mountains, Mid Hills, Teutonia Peak, and Hole-in-the-Wall requires a variety of two-wheel drive, high clearance, and four-wheel drive vehicles depending upon one's destination. In addition, accessing all these areas requires hiking. Hole-in-the-Wall is the most accessible resource, requiring only a two-wheel drive vehicle, and a short, easy hike. Climbing in the New York Mountains is likely the most remote, requiring a four-wheel drive vehicle and long, strenuous hiking to the mountain's upper elevations.

Mojave recognizes that it has a substantial, high-quality climbing resource at Clark Mountain. Visits by park staff, personal communications, and lay publications suggest that the Clark Mountain area provides numerous climbing routes at a high degree of difficulty. In a 1998 article, *Climbing* magazine suggests the routes are on "excellent featured limestone" and that Clark Mountain is "the best limestone cliff in America" (*Climbing*, 1998). *Climbing* also states that at the time of publication, there were 84 one to four pitch (ropelength) climbs on Clark Mountain. Most or all of these routes rely on bolts for protection. It is unknown if more routes have been developed since the publication of the article in *Climbing*. The use of a high-clearance, four-wheel drive vehicle is necessary to reach the Clark Mountain trailhead. Accessing the various climbing routes requires 30 to 90 minutes of strenuous hiking and rock scrambling. The climbing area on Clark Mountain also lies completely within designated wilderness.

### **HUNTING, FISHING, AND TRAPPING**

The California Desert Protection Act provides for the Secretary of the Interior to permit hunting, fishing, and trapping on lands and waters within the Preserve in accordance with applicable federal and state laws. However, the Secretary of the Interior may designate areas where, and establish periods when, no hunting, fishing, or trapping will be permitted for reasons of public safety, administration, or compliance with provisions of applicable law. The National Park Service authority extends not only to federal lands, but to private inholdings and adjacent private land where activities carried out on those lands interfere with the designated use of the federal lands. The National Park Service consults with the California Department of Fish and Game prior to the NPS designation of closed seasons or areas.

Currently hunting and trapping on federal and all private lands within the Preserve is allowed and administered under California Department of Fish and Game regulations. Commonly hunted game species include mourning doves, quail, chukar, rabbits, bighorn sheep, and mule deer. Nongame species are also hunted within the Preserve. These game and nongame species are not uniformly distributed in the Mojave National Preserve. The bighorn sheep prefer steep, mountainous, open terrain; the Rocky Mountain mule deer's preference is high-elevation Great Basin habitats; and the game birds' habitat of choice is the open desert areas near springs or guzzlers.

Mojave National Preserve is also one of the few places in California where bighorn sheep hunting is allowed. Limited hunting of bighorns began in 1987 (BLM 1988). A limited number of permits to hunt bighorn sheep are issued each year through a lottery system. One other permit in addition to the permits issued by the lottery system is awarded each year to the highest bidder, allowing him/her to hunt one animal.

Chukar have been introduced throughout most of the Northern and Eastern Mojave planning area. Rocky Mountain mule deer were introduced in the New York Mountains of the Preserve in the late 1940s (see "Introduced Species" section).

**TABLE 19: NORTHEASTERN SAN BERNARDINO COUNTY BUCK KILL DATA.**

Year	Number of Tags Returned	Year	Number of Tags Returned
1988	29	1993	43
1989	29	1994	36
1990	26	1995	33
1991	28	1996	18
1992	38		

Data from State of California Memoranda from Department of Fish and Game Desert Unit Manager to BLM, Needles (January 1991) and to Vern Bleich, CDF&G Eastern Units Supervisor (May 1996)

**TABLE 20: HUNTING STATISTICS FOR SAN BERNARDINO COUNTY**

ANIMAL	1992	1993	1994	1995
Chukar	37,873	15,001	5,007	5,063
Gambel' s Quail	25,187	26,314	5,984	15,813
Dove	77,799	45,459	49,461	50,463
Jackrabbit	31,455	48,070	28,089	14,103
Cottontail	25,410	27,889	14,044	7,627
Coyote	3,769	4,144	2,280	1,841
Bobcat	-	-	81	99

From State of California memorandum, May 23, 1996

**TABLE 21: BIGHORN SHEEP HARVEST**

Year	Old Dad Unit	Clark Mountain Unit
1987	5	Not Open
1988	5	Not Open
1989	6	Not Open
1990	4	Not Open
1991	5	Not Open
1992	5	2
1993	4	2
1994	4	0
1995	3	0

From personal communication with Vern Bleich, Eastern Units Supervisor, CDF&G

## **HIKING**

Many opportunities for day hiking exist. There are two developed trails: one between Mid Hills and Hole-in-the-Wall campgrounds, and the second a two-mile roundtrip to Teutonia Peak from Cima Road. There are other hiking opportunities — an abandoned road in Caruthers Canyon leads to an old gold mine, Kelso Dunes, and a trail in Piute Canyon leads along sections of the original Mojave Road and into the wash and eventually ends at Piute Gorge. Several former roads now in wilderness areas are closed to vehicle use; such roads may offer opportunities for hiking into Cow Cove, Castle Peaks, and other areas.

Although the park currently has no existing mechanisms for the collection of hiking use statistics, observations at developed trails, inquiries at information centers, and sales of hiking guidebooks indicates that hiking is a fairly popular activity. Hiking occurs by individuals, organized groups, school groups and NPS lead hikes. Probably the most popular hikes include the Kelso Dunes, Teutonia Peak and Rings Trail. During good spring flower years, parking on the road shoulder and hiking across the desert to view wildflowers is also popular.

### **EQUESTRIAN USE**

Horseback riding occurs in the Preserve at several locations. A group called the East Mojave Scenic Area Trail Riders has defined routes out of the Hole-in-the-Wall area that lead into Round, Pinto, Gold and Lanfair Valleys. Watson and Woods washes also serve as routes to Caruthers and Black canyons. Trails often follow old roads or washes or go cross-country. These routes are not marked by signs, so the experience of using them is an informal adventure. The amount of use is unknown.

### **BICYCLING**

Mountain bike use in the Preserve is unknown at this time. Bicyclists have recorded their names in the Mojave Road register, indicating their use of this route. Mountain biking is the third fastest growing equipment-related outdoor activity in the country, as of 1995. Offroad ridership has increased nationally by 20% every year since 1990. In 1995, an estimated 2.5 million to 3 million of those riders were classified as avid trail cyclists.

### **FOUR WHEEL DRIVE TOURING**

The large network of dirt roads leads many visitors to explore the Preserve by 4-wheel drive or other high-clearance vehicles. This road network provides opportunities for dispersed camping; Mid Hills and Hole-in-the-Wall campgrounds offer camping in developed areas. Driving the historic Mojave Road is a very popular activity and has even attracted international visitors. An estimated 2,000–3,000 vehicles a year travel this 4WD route to enjoy the scenery and visit the historic sites noted in the *Mojave Road Guide*. The use of the Mojave Road is expected to continue to increase in coming years.

### **MOTORCYCLES AND ATVs**

Only licensed, street legal motorcycles are permitted on open roads in the Preserve. All terrain vehicles (ATVs) such as three-wheelers and four-wheelers are not permitted. Occasional illegal use occurs on the Kelso Dunes and the Soda Lake area, adjacent to the BLM's Off Highway vehicle area at Rasor. The Preserve has undertaken a number of activities to try and eliminate these illegal uses. Street legal motorcycles do utilize park roads regularly, including both pavement and backcountry dirt roads. Organized groups have been permitted to ride the Mojave Road.

### **AIRCRAFT**

There are no designated airstrips in the Preserve on public lands. Landing of aircraft on roads, dry lakes, or other areas of the Preserve is not allowed. Use of private aircraft must be in accordance with FAA regulations, which provide for a recommended minimum altitude over parks of 2,000 feet.

### **BACKCOUNTRY USE AND ROADSIDE VEHICLE CAMPING**

Camping out of a vehicle has always been permitted in the Mojave, and has continued since the National Park Service began administering the area in 1994. This activity has resulted in an unknown number of traditionally used backcountry roadside campsites scattered throughout the Preserve.

Roadside vehicle camping is allowed at previously disturbed campsites outside of wilderness. No improvements (such as trash containers or metal fire rings) have been made to these sites, although several contain rock fire rings.

Several abandoned structures exist on public land in the backcountry of the park and some have traditionally been used by the public for overnight camping. A good example is the Winkler Cabin off Wildhorse Canyon road. This small, one room shack is maintained and stocked with basic emergency materials by the users. The park has not inventoried all of these structures nor determined their historic significance and value.

### **Camping in High Use Areas**

The BLM management plan for the East Mojave Scenic Area called for the designation and marking of specific campsites in locations that are consistently heavily used by individuals or groups. Although some information is available to identify potentially heavily used sites such as Caruthers Canyon, Cima Dome, Cinder Cones, Clark Mountain, Granite Pass (Kelbaker Road), and Grotto Hills, no systematic inventory of site conditions and use exists. Certainly some sites along the Mojave Road are routinely used because they have been used by organized groups for years, and/or are identified in the guidebook as good camping areas.

### **Camping in Desert Tortoise Critical Habitat**

An inventory of previously used roadside camping sites that exist in desert tortoise critical habitat has not been compiled.

### **No Camping Areas**

There are currently no areas in the Preserve where camping is not allowed.

## **GROUPS AND ORGANIZED EVENTS**

Mojave National Preserve has permitted several group activities and organized events in the last few years, including the following:

- San Bernardino Sheriffs Office Search and Rescue Training for 15 participants.
- Two different mounted horse trail rides, with approximately 50 horses and 10 support vehicles, have also been permitted in the Preserve. They normally travel west to east, beginning and ending outside of the Preserve.
- Mojave Road historical driving tours. The largest was a group of 60 vehicles on the road at one time. The permit was written that a maximum of 17 vehicles in one group were allowed, and groups of vehicles must be at least 5 miles apart at all times.
- Boy Scout groups to camp and explore the Preserve.
- A running/bike relay race. Permit was issued for no more than 75 people at one location, and 30-40 support vehicles. Nine exchange points were in Mojave National Preserve, on the east side.
- Radio Control Airplane event.

## **VISITOR USE FEES**

No entrance fees are collected at Mojave. Campground fees of \$10 per site per night are gathered. In FY99, \$20,904.50 was collected from campground use. In addition, the park charges special use permit fees for groups and organized events, and for commercial filming. These activities generated 5,075.00 in FY99. In April 2000, the National Park Service, in a partnership with the National Park Foundation, announced a new National Parks Pass. A parks pass provides entrance to all national parks for one year at a cost of \$50. Parks selling the pass would be allowed to retain \$35 for use on

projects at that park. These passes are sold at all national parks and over the internet via several retail partners. Mojave sells this pass as a public service, even though an entrance fee is not required to enter the Preserve.

## **RESEARCH AND EDUCATIONAL ACTIVITIES**

### **EDUCATION**

One of the missions of the National Park Service is to conduct educational outreach on natural and cultural resource preservation and management. These outreach efforts extend beyond the park boundary to include classrooms of local schools in and around the park unit. Reaching youth in the classroom and educating them on resource preservation and management serves to protect parks from impacts associated with uninformed visitors pursuing activities that may harm park resources. This effort can do more to protect parks through education than an equivalent number of staff simply enforcing regulations in the park. To fulfill this part of our mission, Mojave maintains an active presence in local classrooms, currently primarily in Needles and Baker.

Park staff also perform outreach through other activities such as local fairs, presentations to local clubs and groups and through the media.

Parks serve as ideal classrooms for students to learn about the natural and cultural resource values of the desert. Setting foot on sand dunes, or a cinder cone, or hiking through the Joshua Tree forest on Cima Dome, are experiences that cannot be duplicated with video, slides or other means. Mojave National Preserve is an ideal natural classroom for school groups anywhere to experience and study the Mojave Desert. To encourage school use, Mojave provides staff to lead specific ranger walks and talks for school groups as requested. Schools are also encouraged to utilize the park for extended classroom work, such as week long classes over spring break, where schools may bring a class and conduct an entire field class focusing on desert resources.

The University of California through the Granite Mountains Natural Reserve, and California State Universities through the Soda Springs Desert Studies Center, also promote school educational activities and offer specific classes for students and the general public via cooperative agreements with the park.

### **RESEARCH AND PERMITS**

The National Park Service is responsible for the review and approval of all proposals for research on Preserve lands to ensure that they conform to the management policies and the provisions of 36 CFR 2.5.

#### **Permits**

The superintendent issues all research and scientific collecting permits. Research that conflicts with current approved research, including long-term study plots that failed to meet NPS standards, would not be approved. All specimens collected from the park must be appropriately curated and have adequate documentation of the specimen, the locality, the geologic context, and other pertinent data. Published research results are required to be provided to the park as a condition of all permits and be made available for use by park staff and the public. In FY99 the park issued 29 research and collecting permits.

## **COMMERCIAL ACTIVITIES**

### **MINERAL DEVELOPMENT**

Mineral development may only occur on valid existing rights inside Mojave National Preserve. Refer to the Land Status section on mining claims for an overview of existing mining claims and the validity process.

Currently, there are no active mining operations inside Mojave National Preserve. Several mines have plans of operation in process with the park, awaiting the outcome of validity exams or environmental compliance. The Cima Cinder mine proposed surface mining of cinder cones in the lava beds area. This owners have applied for patent (obtain title to the surface and subsurface estate) to several of their pre-1955 mining claims. An environmental assessment of this operation has been prepared.

A large-scale open pit surface mine has been proposed for an area just south of the entrance to Caruthers Canyon. The Golden Quail mine proposes to mine gold from a large open pit and then leach the gold using cyanide heap leaching technology. This plan of operation is being held pending the outcome of the validity exam, which was initiated in 1997. Another surface mine has been proposed to mine marble in the Little Cow Hole Mountains near Soda Lake. Validity has been initiated on these claims.

Various proposals have been surfaced to deal with existing hazardous materials issues at the inactive Morningstar Mine, however, none of these has been presented in the form of a formal plan of operations.

Two large-scale surface mining operations exist just outside the boundaries of the Preserve. The Molycorp mine, in Mountain Pass, between Clark Mountain and the Mescal Range, is a rare earths mine. Molycorp has operated since the 1950s and recently, issues with contaminated lands as a result of pipeline leakage and spills have surfaced. Molycorp is currently undergoing a revised mining plan environmental impact process, with the Bureau of Land Management as the lead agency.

Viceroy is the other large scale open pit surface mine adjacent to the park, just north of the Piute Range, in the Castle/Hart Mountain area. This very large scale, open pit and cyanide heap leaching gold mine is very visible from the Lanfair Valley area. Although the Bureau of Land Management approved a ten-year extension of the mine in 1998, recently Viceroy has indicated their intention to terminate mining within the next two years.

### **CATTLE GRAZING**

Cattle grazing has been a continuing activity in the Mojave Desert for well over a century. King and Casebier (1981) described transient grazing activity in the 1850s. American exploring parties and wagon trains using the Mojave Road paused to graze their animals (presumably cattle and sheep) in the Cima Dome and Lanfair Valley areas. Later in the 1870s sheep were driven over the Mojave Road south toward Arizona and New Mexico, perhaps as many as 50,000 head.

From the early 1900s and into the 1930s, much of the western range, including the Mojave Desert, was heavily grazed. For example, in 1920 the Rock Springs Land and Cattle Company alone owned 9,233 cattle, where today fewer than 3,500 are authorized to graze (BLM 1988). Both the acreage and the intensity of livestock use on federal land in the California desert have declined during this century. Stocking of livestock decreased on public lands in Arizona, California, Nevada and Utah by 50% between 1955 and 1985 (Oldemeyer 1994). Professional range management, increased regulation, and

less favorable economic and climatic conditions are factors in stocking declines. Rangelands have generally improved in condition in the latter half of the 20th century, as compared to the turn of the century.

In Mojave National Preserve cattle grazing is permitted on over 1 million acres on portions of 8 previous BLM grazing allotments. The NPS issued permits to the ranchers in 1995 to allow for continuation of grazing while the general management plan was being prepared. Each permit is administered under an allotment management plan developed by the Bureau of Land Management. These plans integrate grazing management on the Preserve and on private and state of California parcels that are leased by the rancher. The plans establishes a grazing system for each allotment, determines the need for range “improvements” (primarily for water), and describes a system for adjusting cattle numbers based on current range conditions. The grazing system is designed to allocate forage based on the amount and type of plant cover, moisture, and other range conditions and forage allocations for other wildlife and burros. The range conditions cited below are based upon data collected through 1992 by the Bureau of Land Management. The Preserve is in the process of updating the assessment of range conditions.

Currently, ranchers in Mojave National Preserve conduct year round open range cow-calf operations. The base herd is comprised of cows and bulls of breeds suited for hot and dry desert conditions. Although breeding can take place year-round, calving is generally in the late winter and early to mid-spring of the year. In late spring, cows and calves are rounded up in groups over a period of 1–2 weeks. Calves are branded, marked and vaccinated and young bulls are castrated. In some operations, “weaner” calves (about six months old) are separated from their mothers in the fall round-up to successfully wean, thereby removing the stress of lactation from the mother cow and allowing her to recover and resume the breeding cycle. “Yearling” calves are rounded up and sold at this time.

To optimize utilization of low-quality forage during winter and drought periods, and to maintain desired animal condition and performance, supplemental nutrients are provided occasionally by ranchers to enhance their livestock’s digestion of low-quality forage. Various kinds of protein and energy feeding supplements have been used intermittently for cattle grazing in the Mojave. Feeding supplements have been provided in times of vegetation dormancy (winter, drought). Supplements provided have included a blend of molasses solids, protein, vitamins, and trace minerals in a hard, crystallized block, a chewable block of grain products and plant protein that supplies additional protein, energy, vitamins, and minerals, cottonseed meal, and salt.

**TABLE 22: GRAZING ALLOTMENTS/PERMITS IN AND ADJACENT TO MOJAVE NATIONAL PRESERVE**

Grazing Allotment	Entire Allotment		Portion of Allotment in Mojave			Range Condition***
	Total Acreage	Total Perennial AUMs	Acreage in Mojave NP	Perennial AUMs (% of total)	Acres in Critical Habitat (%)	
Colton Hills	190,391	2,877	190,391	2,877 (100%)	151,532 (80%)	Good
Gold Valley	16,190	1,152	16,190	1,152 (100%)	1,407 (9%)	Good
Round Valley	653	27	653	27 (100%)	0	Poor
Clark Mountain	88,312	1,872	17,500	371 (20%)	0	Fair
Kessler Springs	252,172	8,016	219,000	7,615 (87%)	197,052 (90%)	Good
Lanfair Valley	339,553	12,168	272,400	11,560 (80%)	120,564 (44%)	Good
Valley View	281,802	8,485	268,000	8,609 (95%)	225,486 (84%)	Good
Valley Wells	237,258	4,644	43,600	853 (18%)	8,000 (50%)	Fair
Piute Valley*	33,468	0	14,700	0 (0%)	0	Fair
<b>Totals</b>	<b>1,439,799</b>	<b>39,241</b>	<b>1,042,434</b>	<b>32,524</b>	<b>716,367</b>	

\* = Ephemeral grazing only; no perennial authorization

\*\* = An AUM is an animal unit month, defined as the amount of forage required by an adult cow and calf (or an equivalent combination of other animals) for one month (BLM, 1984).

\*\*\* = Evaluation of range conditions as determined by BLM prior to 1992.

As of April 2000, the Crescent Peaks allotment (1,276 AUMs) and the Granite Mountains allotment and permit (4,475 AUMs) have been permanently retired, resulting in a reduction of grazing in the Preserve by 15% since the Preserve was established.

### **FILMING**

Permits for commercial operations such as moviemaking and guided recreational tours have been applied for and granted within the Preserve. At this time, the number of permits applied for is relatively low. For instance, in FY99 only one filming permits was issued.

### **SOLID WASTE DISPOSAL**

Federal law and NPS regulations (36 CFR Part 6) prohibit solid waste disposal, including existing and new landfills, in all units of the national park system. The park hauls all solid waste generated by visitors and park operations to an approved site outside the Preserve. The Baker landfill was closed by state law in 1997. The site was recontoured and fenced (including tortoise proof fencing) and is being monitored by the county. Small private dumps and illegal dumping has occurred at a number of sites throughout the Preserve. Several of these have been cleaned up by the National Park Service and this process is ongoing as cultural clearance is completed.

## **VISITOR SERVICES**

At this time, the Cima Store is the only facility-based commercial operation in the Preserve. The privately operated store on private land has a limited number of items on hand but continues to serve customers traveling on the Kelso-Cima Road. Special use permits are issued for commercial services such as guided tours and hunting guide services. Currently, the park issues permits annually to 2 licensed hunting guides to provide guiding service for bighorn sheep hunts.

Several commercial facilities outside the Preserve offer lodging, food, and other items. The town of Baker has several motels, gas stations, restaurants, fast-food services, and markets. Small facilities at Halloran Summit and the Cima Road exits off Interstate 15 offer various visitor services. Primm, Nevada, about 15 miles from the Preserve's north boundary, contains a major resort/casino. Nipton offers a small amount of lodging and a few camping spaces. Goffs has a small restaurant that is not always open for business, and Fenner has a gas station/market. Needles offers a broad range of services to visitors.

## **MILITARY ACTIVITIES**

The Preserve is within 100 miles of five U.S. Department of Defense facilities having air operations: National Training Center at Fort Irwin, China Lake Naval Air Weapons Station, Marine Corps Air-Ground Combat Center, and Air Force Bases at Edwards and Nellis. Military aircraft from these facilities occasionally use airspace over the Preserve.

Mojave is subject to irregular and occasional such use along specified training routes. A small area of the park near Baker is under FAA designated special use airspace, called the "Silver" military operations area (MOA). This special use airspace and IR (instrument) and VR (visual) routes and are created by the Federal Aviation Administration to warn other civil aviation pilots that high speed (over 250 knots), low level (down to 200 feet above ground level) aircraft may be encountered. The CDPA also emphasizes that nothing in the Act shall preclude the designation of new special use airspace and training routes over parks and wilderness areas. Slower military aircraft, such as helicopters, may be encountered anywhere over the Preserve.

Title VIII of the California Desert Protection Act, 1994, contains the following provision:

Nothing in this Act, the Wilderness Act, or other land management laws generally applicable to the new units of the National Park or Wilderness Preservation Systems (or any additions to existing units) designated by this Act, shall restrict or preclude low-level overflights of military aircraft over such units, including military overflights that can be seen or heard within such units.

